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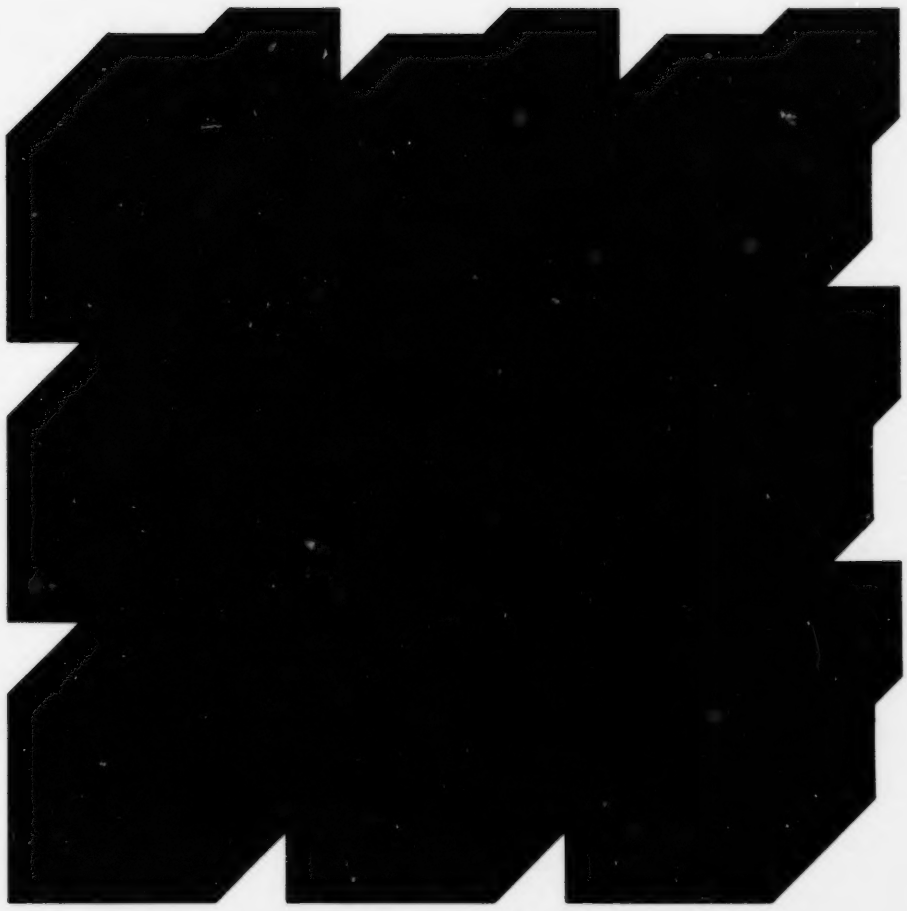

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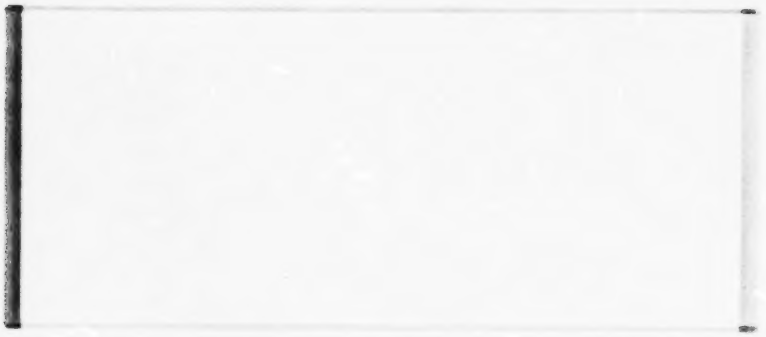

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DISCUSSION PAPER No. 316

Structural Change in Employment of Industries and Occupations, 1971-81: An Input-Output Analysis

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Résumé

Les tendances de l'activité industrielle sont continuellement en évolution. De nouveaux emplois sont créés, alors que d'autres disparaissent. L'économie dans le secteur commercial est en constante mutation. Dans certaines professions et secteurs industriels, la croissance de l'emploi est rapide alors qu'elle ralentit dans d'autres, entraînant une restructuration (ou une redistribution) de l'emploi. Des changements structurels sont indispensables pour qu'une économie puisse s'adapter aux nouvelles possibilités qui s'offrent et tirer parti des nouvelles méthodes et technologies et contribuer à accroître la productivité et la richesse. Mais une chose est préoccupante; les travailleurs déplacés (en chômage), à cause de ces changements, peuvent avoir de la difficulté à s'adapter et à trouver de nouveaux emplois, particulièrement en période de chômage élevé. Il est inquiétant de noter que le rythme de la restructuration pourrait souffrir de la tournure des événements, comme une modification de la structure du commerce extérieur (attribuable à une libéralisation des échanges, par exemple) et de l'accélération du progrès technologique.

La présente analyse a été éffectuée par suite de l'intérêt manifesté pour la croissance de l'emploi et le changement structurel. Le premier but des auteurs est d'élucider les facteurs qui ont été les plus étroitement liés à la croissance et à la restructuration de l'emploi dans les industries et les professions, de 1971 à 1981. On y trouve une analyse des changements suivants :

a) la croissance (ou la diminution) de l'emploi dans les industries et les professions;

b) les caractéristiques qui différencient les industries et les professions où la croissance est la plus rapide de celles où il y a régression;

c) la restructuration (ou la redistribution) de l'emploi dans les industries et les professions.

Les auteurs utilisent le modèle d'entrées-sorties de Statistique Canada, ainsi que des données de recensement sur les industries et les professions pour les années 1971 et 1981. Ils peuvent ainsi examiner les relations entre les variations de l'emploi et les modifications des facteurs suivants :

a) la demande finale intérieure de biens et services;

b) la productivité du travail (ou les ratios emploi/ production);

c) le niveau et la composition des importations et des exportations (modification des échanges);

d) les changements structurels dans le modèle d'entrées-sorties (modifications aux matrices relatives à la technologie et aux parts du marché);

e) l'évolution de la composition des professions dans divers secteurs industriels;

L'avantage particulier de l'analyse tient au fait qu'elle intègre les effets interindustriels. Ainsi, l'exportation de produits du bois influe sur l'emploi non seulement dans cette industrie, mais aussi dans celle du transport et d'autres qui approvisionnent l'industrie du bois. L'étude tient compte de ces effets[1], apportant ainsi une amélioration considérable sur d'autres études semblables à facteurs décomposables effectuées au Canada et aux États-Unis.

Croissance de l'emploi dans l'industrie

En général, la croissance (ou le manque de croissance) de l'emploi dans l'industrie a été davantage imputable au changement dans la demande finale intérieure de biens et services qu'aux variations de tout autre facteur. Une part d'environ 50 % de l'augmentation de l'emploi entre 1971 et 1981 est attribuable à ce changement. Elle a cependant été contrebalancée par une diminution des besoins d'emplois, à cause de la productivité du travail (8 %), de modifications dans le commerce extérieur (4 %) et d'autres changements résiduels (2 %).

Les secteurs industriels les plus favorisés par la croissance de l'emploi découlant de la hausse de la demande finale intérieure comprennent les services commerciaux (finances, assurances, affaires immobilières et services de gestion aux entreprises) et le secteur des services de consommation (alimentation et logement, divertissement et loisirs, et services personnels). Ce sont le secteur primaire et l'industrie de la construction qui ont été le moins avantagés. La croissance de la demande finale intérieure de produits manufacturés (importés et canadiens) a été supérieure à la moyenne, mais la moitié de cet accroissement est attribuable aux importations. Or l'influence de la croissance de la demande finale intérieure sur l'emploi national dans le secteur manufacturier était en dessous de la moyenne pour l'économie dans son ensemble.

La croissance de la demande finale intérieure dans le secteur de la fabrication a aussi joué un rôle majeur pour déterminer les industries les plus prospères et celles qui se sont trouvées en perte de vitesse en terme d'emploi. L'effet des changements dans la productivité du travail et le commerce, au cours de la décennie, ont été en général à peu près les mêmes dans les deux catégories[2].

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[1] Comme nous le verrons plus loin d'une façon plus détaillée, il convient de signaler un certain nombre de limites à notre analyse. Premièrement, dans le modèle d'entrées-sorties nous modifions les cinq facteurs un à la fois, en supposant que tous les autres demeurent constants. Nous ne retenons aucune interaction entre les facteurs, mais les seuls effets directs de premier ordre de chaque facteur sur l'emploi. C'est pourquoi il faut considérer les résultats comme approximatifs. Deuxièmement, le modèle suppose que toutes les importations causent des pertes d'emplois au pays, mais tel n'est pas toujours nécessairement le cas, pour certaines raisons exposées dans le rapport. C'est donc dire que les effets négatifs des importations sur l'emploi sont probablement surestimés.

[2] Ces facteurs (productivité et changements dans le commerce extérieur) ont un effet très important sur certains secteurs industriels (particulièrement sur le secteur manufacturier) et cet effet varie considérablement d'un secteur à l'autre. Le lecteur est prié de se référer aux tableaux en annexe pour de plus amples détails.

Les industries (comme d'ailleurs les professions) qui ont accru leurs besoins d'emplois à cause de l'évolution des échanges commerciaux, au cours de la décennie, sont toutes reliées, d'une façon ou d'une autre, aux ressources naturelles du Canada; il s'agissait soit d'industries de ce secteur, d'autres du secteur manufacturier transformant les ressources naturelles, ou encore d'industries fournissant des services au secteur des ressources naturelles (comme celle du transport). Voilà qui montre de nouveau l'effet de l'avantage comparatif du Canada quant à l'emploi dans le secteur des ressources naturelles.

Restructuration de l'emploi dans l'industrie

L'emploi a augmenté dans le secteur tertiaire au cours de la décennie, mais aux dépens du secteur de la production de biens. Les facteurs les plus importants de ces changements structurels de l'emploi ont été : (1) l'utilisation plus intensive des services comme facteurs intermédiaires dans la production de l'économie, et (2) la croissance plus rapide de la productivité dans le secteur de la production de biens qui a contribué à réduire les besoins d'emplois dans ce secteur.

Par ailleurs, les facteurs qui ont contribué à l'expansion du secteur des services ont été différents d'un sous-secteur à un autre. Par exemple, l'accroissement de la part de l'emploi allant aux services de consommation est venu presque exclusivement de la croissance beaucoup plus lente -- en fait, négative -- de la productivité dans ce secteur, qui s'est soldé par un accroissement de la main-d'oeuvre. Mais l'augmentation par les services commerciaux de leur part de l'emploi n'a rien eu à voir avec les différences de productivité; elle a plutôt été attribuable à une augmentation plus rapide de la demande finale et intermédiaire de ces services.

Lorsque l'on considère la nouvelle répartition générale de l'emploi parmi les 39 industries, on retrouve, comme principal facteur, la demande finale intérieure (qui compte pour 37% de la distribution totale des emplois), suivie des variations de la productivité du travail (23 %), des changements dans la matrice de la technologie et dans celle des parts du marché (22 %), ainsi que les différences entre les industries pour ce qui est des effets, sur l'emploi, de l'évolution du commerce extérieure (18 %).

Croissance de l'emploi dans les professions

La plus forte croissance de l'emploi s'est manifestée dans les domaines de la gestion et de l'administration, des professions qui exigent des qualifications très élevées (études post-secondaires), et de celles du secteur des services; elle a été la plus faible dans le secteur primaire (agriculture, exploitation forestière, industrie minière), l'usinage, la construction, la manutention et les autres professions de cols bleus.

Il faut conclure que, de façon générale, la demande finale intérieure a été à l'origine de la plupart des variations de l'emploi au cours de la décennie, bien qu'il y ait eu d'importantes différences entre les professions quant à l'effet de ces facteurs. Une partie de cette demande provenait des importations. Il y a eu des cas, notamment dans les professions du secteur du traitement, de la machinerie et des produits de la fabrication, où la croissance de la demande totale intérieure pour des

biens produits dans ces professions était très élevée, mais la plus grande partie de cette demande fut satisfaite par une augmentation des importations et non par une plus forte production nationale.

Les modifications à la composition des professions dans les secteurs industriels -- et qui ont été peut-être attribuables, entre autres, à l'utilisation de nouvelles méthodes de production, au progrès technologique ou au besoin accru d'information -- ont eu tendance à accélérer la croissance de l'emploi dans le domaine de la gestion et de l'administration et dans les professions exigeant des qualifications élevées, et à ralentir cette croissance dans la plupart des autres professions, notamment celles occupées par les cols bleus.

La croissance de l'emploi supérieure à la moyenne dans le secteur des services (alimentation et boissons, logement, services de protection et de sécurité, et services personnels) a été possible en grande partie à cause de la croissance négative de la productivité dans les services de consommation, lesquels ont embauché de plus en plus de travailleurs.

L'évolution de la composition des professions dans les secteurs industriels et la croissance de la demande finale intérieure ont été les deux principaux facteurs qui ont permis d'obtenir une différenciation entre les professions dont la croissance était la plus rapide et celles qui étaient en déclin. Les changements dans le commerce extérieur et dans la productivité de la main-d'oeuvre ont eu des effets similaires dans ces deux cas.

Restructuration de l'emploi dans les professions

Durant la décennie, il y a eu un accroissement de 7,3 points de pourcentage dans la part de l'emploi dans les professions de cols blancs au profit des cols bleus. Tous les facteurs ont joué un rôle dans la restructuration des emplois, sauf les changements dans le commerce extérieur. Le facteur le plus important fut la plus grande croissance de la demande totale intérieure des biens et services produits par les cols blancs. Mais, les autres facteurs furent toutefois importants pour la restructuration des emplois.

Quand on considère la restructuration totale des emplois parmi les 81 professions, les deux facteurs que nous avons mentionnés (la composition des professions et la demande finale intérieure) ont pourvu à la plus grande partie de la restructuration de l'emploi dans les diverses catégories professionnelles (30% chacun); le reste s'est réparti de façon égale entre les autres facteurs. Les cols blancs et les professions libérales ont accru leur part de l'emploi aux dépens des cols bleus, tous les facteurs jouant un rôle, sauf le commerce extérieur. Une fois encore, c'est la demande finale intérieure qui a exercé la plus forte influence.

Le progrès technologique et ses effets sur les méthodes de production ne sont pas considérés comme un facteur distinct dans notre analyse, mais ils se reflètent dans trois autres, soit l'évolution de la composition des professions dans les secteurs industriels, la variation de la productivité du travail et les modifications de la matrice de la technologie dans le modèle d'entrées-sorties. Il a pu aussi se produire des changements dans ces trois facteurs pour d'autres raisons (comme la variation des prix relatifs). Toutefois, globalement, ces derniers ont contribué pour plus de 60% à la restructuration qui s'est effectuée entre les professions de cols bleus et celles de

cols blancs, y compris les professions libérales. Il est donc probable que le progrès technologique a joué un rôle important dans ce processus, mais la présente analyse ne permet pas d'en déterminer l'incidence précise.

Summary

The pattern of industrial activity, and hence of employment, is constantly changing. New jobs are created and old ones disappear. The commercial economy is in a constant state of flux. Some industries and occupations experience rapid employment growth while others are in decline, leading to a restructuring (or redistribution) of employment. Such structural change is essential if an economy is to adapt to new opportunities and take advantage of new methods and technologies which increase productivity and wealth. But there is concern that workers displaced (unemployed) in this process may have difficulty adapting to the change and locating new employment, particularly in times of high unemployment. There is also concern that the speed of the restructuring may be affected by possible future events such as a change in trading patterns (due to possibly freer trade) and more rapid technological change.

Because of the interest in employment growth and structural change, this analysis was undertaken. It is hoped that it will contribute to the understanding of the major factors closely associated with employment growth and restructuring among industries and occupations between 1971 and 1981. Three aspects of employment change are analysed:

(a) the growth (or decline) in employment in industries and occupations;

(b) the features which distinguish the fastest growing from the declining industries and occupations;

(c) the restructuring (or redistribution) of employment among industrial and occupational sectors.

The study utilizes Statistics Canada's Input-Output model, along with census data on industries and occupations for 1971 and 1981. This allows the historical relationship between employment change and the change in the following factors to be examined:

(a) domestic final demand for goods and services;

(b) labour productivity (or job/output ratios);

(c) the level and mix of imports and exports (change in trade);

(d) structural changes in the input-output model (changes in the technology and market share matrices);

(e) the changing mix of occupational skills employed within industries.

The strength of the analysis is that it incorporates inter-industry effects. For example, the exporting of wood products not only affects employment in that industry, but in transportation and other industries providing inputs to the wood industry as well. These effects are captured.[1] This is a considerable improvement over similar decomposition studies conducted in Canada and the United States.

Growth in Industrial Employment

In general, the growth (or lack of growth) in industry employment was due more to the change in domestic final demand for goods and services than to changes in any other factor. Some 50% rise in employment between 1971 and 1981 was attributable to this factor. This was offset by a decline in employment requirements due to labour productivity (8%), changes in trade (4%) and other residual changes (2%).

The industrial sectors which benefitted the most in terms of employment growth from the rising domestic final demand included the Business Services sector (which includes Finance, Insurance, Real Estate and Services to Business Management) and the Consumer Services sector (Food and Accomodation, Amusement and Recreation and Personal Services). The Primary sector and Construction benefitted the least. The growth in domestic final demand for manufactured goods (imported and domestically-produced) was above average, but over half of this rise was met by imports. Thus, the influence of rising domestic find demand on *domestic* employment in Manufacturing was below the average for the economy as a whole.

Within the Manufacturing sector, the growth in domestic final demand was also largely responsible for distinguishing the fastest growing from the declining industries. The effect of changes (as measured by employment) in labour productivity and trade on employment over the decade were roughly the same for the two groups (the fastest growing and declining) *in the aggregate*.[2]

The industries (and for that matter, occupations) which increased their employment requirements due to changes in trade over the decade were all related in some way to Canada's natural resource base; they were either natural resource industries, manufacturing industries which processed natural resources, or industries which serviced the natural resource sector (transportation). This again demonstrates the effect of Canada's comparative advantage in the natural resource area of employment.

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1 As will be seen later in more detail, a number of limitations of the analysis must, however, be stressed. First, in the input-output model the five factors are changed one at a time, assuming all other factors remain constant. No interaction among the factors is captured, and only first-order, direct effects of each factor on employment is captured. For that reason, the results should be considered exploratory. Second, the model assumes all imports displace domestic employment, although this is not necessarily the case for reasons outlined in the report. Thus, the job displacement effects of imports are likely over-estimated.

2 These factors (productivity and changes in trade) have a significant effect on particular industries (especially in manufacturing) and this effect varied considerably by industry. Readers are encouraged to examine the detailed appendix tables for industry-specific results.

Restructuring of Industrial Employment

Increase in the Service sector's employment share over the decade was at the expense of the Goods-Producing sector. The most important factors in bringing about this structural change in employment were: (1) the greater use of services as intermediate inputs in producing the economy's output, and (2) the more rapid productivity growth in the Goods-Producing sector, which reduced employment requirements in that sector.

But the factors associated with the Services sector's rise differed from one sub-sector to another. For example, the Consumer Service's employment share increase was almost exclusively due to the much slower (in fact negative) productivity growth in that sector, which was labour-using rather than labour-saving. But the Business Services' expansion of employment share was not related to productivity differentials at all; rather, it was due to a more rapidly rising final and intermediate demand for their services.

Overall, when considering the total redistribution of employment among 39 industries (not just two sectors), the predominant factor is again domestic final demand (accounting for 37 % of the total redistribution of employment), followed by variations in labour productivity (23%), changes in the *technology* and *market share* matrices (22%) and variations among industries in the employment effects of changes in trade (18%).

Growth in Occupational Employment

Employment growth was highest in Management/Administration, Highly-Qualified (roughly requiring postsecondary education) and Services occupations, and lowest in Primary Sector (Farming, Forestry, Mining), Machining, Construction, Material Handling and other blue collar occupations.

Generally speaking domestic final demand was responsible for most of the employment changes that have occured over the decade, although there was substantial variations among occupations in the effect of this factor. And some of this demand was met by imports. There were cases -- notably in processing, machining and product manufacturing occupations -- where the growth in total domestic final demand for commodities produced by these occupations was quite high, but much of this demand was met by a rise in imports rather than by increased domestic production.

Shifts in the mix of occupational skills employed within industries -- resulting perhaps from changing production processes, technological change, the increased need for information, etc. -- tended to increase employment growth in Managerial/Administration and Highly-Qualified occupations and decrease it in most others, notably in the Blue Collar occupations.

The above-average growth in the Service occupations (Food and Beverage, Lodging, Protective, Apparel and Personal Services occupations) was due largely to the negative productivity growth in the Consumer Services sector, which was increasingly labour-using than labour-saving.

The changing mix of occupational skills employed within industries and the growth in domestic final demand were the two most important factors which distinguished the fastest growing from the declining occupations. Changes in trade and productivity had roughly the same effect on employment in these two groups of occupations.

Restructuring of Occupational Employment

White collar and professional occupations increased their share of employment by 7.3 percentage points over the decade at the expense of blue collar occupations. All factors played a role in this structural shift except for changes in trade, which did not contribute to this restructuring. The largest single contribution was the more rapid growth in domestic final demand for goods and services produced by white collar and professional occupations, but other factors were important as well. When considering the total restructuring of employment among 81 occupations, the two factors previously mentioned (skill mix and domestic final demand) accounted for most of the redistribution (30% each), while the balance was distributed equally among the remaining factors.

Technological change and its effect on production processes is not a separate factor in this analysis, but it is reflected in three factors -- the changing skill mix within industries, changing labour productivity levels and changes in the *technology* matrix in the input-output model. Other reasons (such as relative price change) can also contribute to changes in these three factors. But together, these three factors accounted for over 60% of the restructuring from Blue Collar to White Collar/Professional occupations. Thus, it is likely that technological change played an important role in this restructuring, but its exact effect cannot be established in this analysis.

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Foreword

Recently, changes in trade and technology have probably been, in many peoples mind, associated most closely with the concept of longer-term employment restructuring. A major restructuring of employment may result in a sizeable number of displaced (unemployed) workers in some industries and occupations, and a high demand in others. But structural change, while being ongoing, is necessary if Canada is to reap the benefits of new technologies and market opportunities.

Employment restructuring and worker displacement resulting from plant closures, mass layoffs or firms going out of business may result from a number of factors. It is thus often difficult, if not impossible, to conclude that permanent job loss (or displacement) in a particular industry resulted from a single reason (e.g., import competition). There may, in fact, be a combination of reasons, such as import competition, changes in consumption patterns of Canadians, increases in labour productivity (resulting in fewer workers being required to produce the same output) and so on. In this case, one would be hard pressed to say that a single factor resulted in job losses or layoffs. Changes in technology, for instance, may be better seen in the context of the effects of other factors, such as changes in the patterns of domestic demand. Thus, it seems most reasonable to discuss the issue of employment restructuring and labour market adjustment when considering a number of factors, not a single factor such as changes in trading patterns.

This study will provide some understanding of those factors most closely associated with employment growth and restructuring among industries and occupations. As such, it will allow us to identify those industrial sectors and occupations for which major changes have occurred and for which further analysis could be done.

Judith Maxwell
Chairman

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Structural Change in Employment of Industries and Occupations, 1971-1981: An Input-Output Analysis

1 Introduction

The 1970s was a period of major change in the Canadian economy. The unemployment rate rose from 6.2 to 7.5 percent over the 1971-1981 period, while the Consumer Price Index rose from 2.9% to 12.5% over that same period. This was also the period of the productivity decline. Labour productivity in the commercial economy, which was rising at a rate of approximately 7% annually around 1971, had fallen to a state of virtually zero growth by 1981. Associated with this productivity decline was a reduction in the growth of real wages from approximately 5% annually around 1971 to a rate inferior to zero in the late 1970s and to one of 0.8% in 1981. Growth in the output of the commercial economy, as measured by Real Domestic Product (RDP), also declined over that period. It was in the 5% range leading up to 1971, but had fallen to around 3% during the 3 years leading up to and including 1981. Moreover, during this period, Canada's economy became increasingly open as both the export share (exports as a percent of total production) and input share (imports as a percent of all domestically-available goods) in the manufacturing sector rose. The export share of manufactured goods rose from 24 to 28 percent over the 1971-1981 period, while import share increase from 27 to 34 percent.

Thus, there were significant changes during the decade in many of the economic indicators. Not surprisingly, there was also some change in the employment structure among industries, although when examining some 42 industry groupings, it was found that the restructuring (or redistribution) of employment was not as great during the decade as it had been during the 1950s and 1960s. Looking at the very broad sectors, the goods-producing sector's share of the labour force declined from 38 to 34% over the 1971-1981 period. It had, however, dropped more dramatically during the earlier two decades, falling from 53% in 1951. Manufacturing's share of the labour force fell from 21% in 1971 to 19% in 1981. The gains were, of course, in the Service sector as its share rose from 62 to 66% over that same period (Picot, 1986).

This structural change in employment was not, however, matched by corresponding changes in the structure of output as measured by Real Domestic Product (RDP). The Goods-Producing share of RDP with the commercial economy fell only one percentage point (from 43 to 42%) during the decade, while Manufacturing's share remained constant at 25%. Note that the data on RDP refer to the commercial economy[1], while the earlier labour force data cited above referred to the entire economy.

Although change in the industry mix of employment had slowed down during the 1980s, as compared to the 1950s and 1960s, there has been a considerable concern about structural change. In particular, there is concern that the increasing trade

[1] Excluding Education, Health, Welfare and Public Administration. .

liberalization could lead to extensive structural changes, requiring labour adjustment policies to assist workers in declining industries. The pattern of industrial activity, and hence of employment, is constantly changing, and many different factors can lead to structural change. New jobs are created and old ones disappear. Some industries and occupations undergo rapid expansion in employment while others languish. The commercial economy[2], which accounts for approximately three-quarters of all employment, is in a constant state of flux. Long-term changes (rather than shorter term change induced by the business cycle) in a number of factors result in a variation in growth patterns and the resulting restructuring (or redistribution) of employment among industries and occupations. In this study, which utilizes Statistics Canada's input-output model to examine the growth and restructuring of industrial and occupational employment, these factors include changes in:

(a) the level and mix of imports and exports;

(b) final domestic demand for goods and services;

(c) labour productivity (change in the job-output ratios);

(d) the mix of goods and services used as intermediate inputs in the production process (the *technology* and *market share* matrices)[3]; and

(e) the mix of occupational skills employed within industries.

Changes in any or all of these factors may influence employment growth patterns and the restructuring of employment by industry and occupation. This report examines two aspects of employment change over the 1971-1981 period: the growth in employment in various industries and occupations and the restructuring (or redistribution) of employment among industries and occupations. Each of these measures (growth and restructuring) are decomposed into the share due to each of the above mentioned factors. It is necessary to consider these two aspects of change (growth and restructuring) separately. A factor such as changes in trade may be quite significant in the growth of employment of industries, but have little to do with the restructuring of employment among industries. The latter is dependent upon the variation in growth among industries (or occupations) due to the factor, not the absolute level of growth itself.

One factor which is much discussed but not included in the list is technological change. This factor is not explicitly considered in this study, since it is difficult to

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2 The entire economy excluding Public Administration, Hospitals, most of the Education sector, and Religious and Welfare organizations.

3 These are the major input (technology) and output (market share) matrices in the Input-Output model. The technology matrix represents each commodity input used in the production as a proportion of the total intermediate input to an industry. A shift in this matrix indicates that some commodities increased their share of intermediate inputs, while others lost. The market share matrix represents each industry's output as a proportion of the total output (production) of a specific commodity. A shift in this matrix indicates an industry's share of output of a commodity is increasing or decreasing.

interpret input-output results such that the effect of technological change, as popularly understood, can be isolated. Technological change does affect a number of the factors listed, including labour productivity and the mix of intermediate inputs used in the production process, but so are other variables which can also influence these factors, and hence technological change is not explicitly considered.

But why study industrial or occupational restructuring of employment? One major reason is its relationship to labour market adjustment. A major restructuring of employment may result in a sizeable number of displaced (unemployed) workers in some industries and occupations, and a high demand for labour in others. Retraining, mobility assistance, income maintenance or other government initiatives may be required for both equity and efficiency reasons under such cicumstances (see, for example Saunders, 1984 or Pearson and Salembier, 1983).

Recently, changes in trade and technology have probably been, in many peoples mind, associated most closely with the concept of longer-term employment restructuring. While technology is not explicitly considered here, related factors, such as labour productivity, the changing mix of skills within industries and the changing mix of intermediate inputs, are discussed. This work also allows the role that changes in trade played in the restructuring of employment to be placed in the context of the importance of other factors.

Employment restructuring and workers displacement resulting from plant closures, mass layoffs or firm going out of business may result from a number of factors. It is thus often difficult, if not impossible, to conclude that permanent job loss (or displacement) in a particular industry resulted from a single reason (eg., due to import competition). There may, in fact, be a combination of reasons, such as import competition, changes in the consumption patterns of Canadians, increases in labour productivity (resulting in fewer workers being required to produce the same output) and so on. In this case, one would be hard pressed to say a single factor resulted in job losses or layoffs. Furthermore, there may be an interaction among these factors; for example, the increase in labour productivity may have been in part the result of the presence of competition from lower-priced imports. Thus, it seems most reasonable to discuss the issue of employment restructuring and labour market adjustment when considering a number of factors, not a single factor such as changes in trading patterns.

The *major objective* of this study, then, is to acquire some understanding of those factors most closely associated with employment growth and restructuring among industries and occupations by using Statistics Canada's input-output model. It should be stressed, however, that one cannot interpret these results as indicating causality in the relationship between employment changes and the factors. This is because there are interactions among the factors which are not captured in the input-output model. For example, productivity change may not be independent of the change in the level of imports (ie., import competition often leads to rises in productivity). Similarly, rises in productivity may lead to reduced prices, which lead to increases in domestic demand, and hence increases in employment requirements. These indirect effects are not captured in the model. One might consider this approach as capturing the direct effects of, say, productivity change on employment, but not the indirect effects of, say, productivity change on domestic demand and hence on employment. The analyses of historical data cannot say anything about *why* the observed changes of the factor occurred, only on the direct effect of these changes in employment.

Thus, the *strength of this work* is its ability to provide an approximate, first-order measure[4] of the relative importance of the observed changes in trade, productivity and domestic final demand on the employment structure in Canada. As such, it allows us to identify those industrial sectors and occupations for which major changes have occurred and for which further analysis could be done. The fact that it uses an input-output methodology is important because this allows the indirect impact of changes in one industry or another (since the output of one industry is the input to another) to be incorporated. For example, when a product such as plywood is exported from Canada, this transaction not only affects employment in the wood industry, but since it requires machinery and transportation services to produce and deliver the plywood, employment in the industries supplying these intermediate inputs are also positively affected. Similarly, when an import replaces a domestic product, the employment requirements in industries that would have provided intermediate inputs to produce the imported product also experience a *displacement* of employment. The input-output model allows such effects to be captured. But it is not a simulation which tests alternative scenarios, such as how many jobs would have materialized in Canada had some other trade pattern been observed. A simulation which incorporates price effects is needed to estimate the number of jobs lost because trade followed one pattern rather than some other.

1.1 Methodology

Basically, the methodology consists of changing each of the five factors mentioned previously one at a time in the input-output model. For example, the 1981 exports are replaced by the 1971 exports in the model, and any change detected in employment levels of industries (or occupations) between the runs with the 1981 and 1971 level of exports are ascribed to the change in the mix and level of exports between the two years. Thus, the level of exports are changed *keeping all other factors* (imports, domestic demand, labour productivity, etc.) *fixed*. When both 1981 exports and imports are replaced by the 1971 level, this is the effect of net changes in trade between the two years on employment requirements. This process continues as the 1981 levels of domestic demand and labour productivity are replaced by their 1971 values, one step at a time. A more detailed description of the methodology is included in Appendix B.

The largest disagregation of the input-output tables were used as a basis for most of the analysis that follows. A total of 191 industries and 602 commodities were used, but more often than not, the results are reported using a smaller aggregation (43 industrial sectors and 92 commodities). Of the 43 sectors, Owner Occupied Dwellings, Transportation Margins, Operating, Office, Laboratory and Food, and Travel and Advertising Promotion were excluded from the analysis as no employment could be associated with those sectors.

In order to compare compare 1981 and 1971 results for each industrial sector, input-output tables used were in constant 1971 dollars. The two dates were chosen for the following reasons:

(a) 1981 was the latest year for which input-output data was available;

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[4] The direct effect of the variable on employment is observed, but the indirect effects resulting from interactions among the variables are excluded.

(b) the availability of other sources of information, such as the Censuses, provided additional insights for the analysis, particularly as regards to an analysis of occupational distribution which can only be obtained through the use of Census data; and

(c) the two dates coincide with similar phases in the business cycle (the capacity utilization rate in Manufacturing was 83.5% in 1971 and 80.1% in 1981).

2 Changes in Industrial Employment

2.1 Growth of Industrial Employment

Generally speaking, employment has been rising more quickly in the Services sector than in the Goods-Producing sector. Between 1971 and 1981, the Services sector employment rose an annual average of 4.6%, while the Goods-Producing sector employment increased on an annual average by only 1.4%. Since both years were roughly in the same position in the business cycle, this variation in growth rates is not primarily due to business cycle effects. This differential growth rate in the Goods-Producing and Commercial Services sectors has existed at least since World War II (see Picot, 1986), and studies of the cause of this difference have generally concluded that the major reason is the variation in the rate of growth of productivity as between these two sectors (see, for example, Magun, 1982; Chand, 1983). But the interest here lies not only on those two broad sectors, but also on industries at a more detailed level.

Between 1971 and 1981, total employment (full and part-time) in the entire com - mercial economy rose by 35% , and the Business Services sector (including Services to Business Management, Finance, Insurance and Real Estate) grew the fastest at 6.4% annually on average, Consumer Services next at close to 6% annually, while Manufacturing and Primary industries increased at only 1.2% and 0.7%, respectively[1]. (see Chart 2-1).

This total rise of 35% is largely attributable to a large increase in domestic final demand for goods and services (including domestically-produced and imported), which resulted in a sizeable increase in employment requirements (50 %). This large increase, however, was offset by a decline in employment requirements due to increases in labour productivity (8%), a decline due to trade (4%) and a drop due to other residual changes (changes in the technology and market share matrices) (3%). (see Chart 2-2 below and Table A-1 in the Appendix for a more detailed industry analysis).

Thus, at the level of the total commercial economy, changes in domestic final demand for goods and services is the overwhelming factor in determining employment growth, but the other factors also played an important role. These conclusions must be considered preliminary since they do not account for interaction effects.

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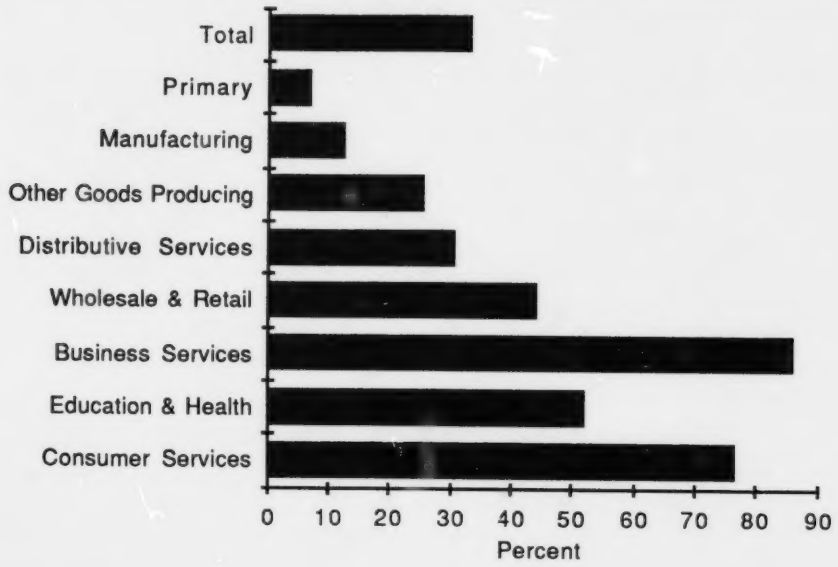
[1] The Primary sector includes Agriculture, Forestry, Fishing, Hunting and Trapping, Metal Mines, Mineral Fuels, Non-Metal Mines & Quarries and Services Incidental to Mining. Other Goods Producing sector is comprised of Construction Industry, Electric Power, Gas & Other Utilities, while Distributive Services is composed of Transportation and Storage and Communications. Business Services includes Other Finance, Insurance and Real Estate and Services to Business Management, while Consumer Services is composed of Amusement and Recreation Services, Accomodation and Food Services and Other Personal and Miscellaneous Services.

Chart 2-1

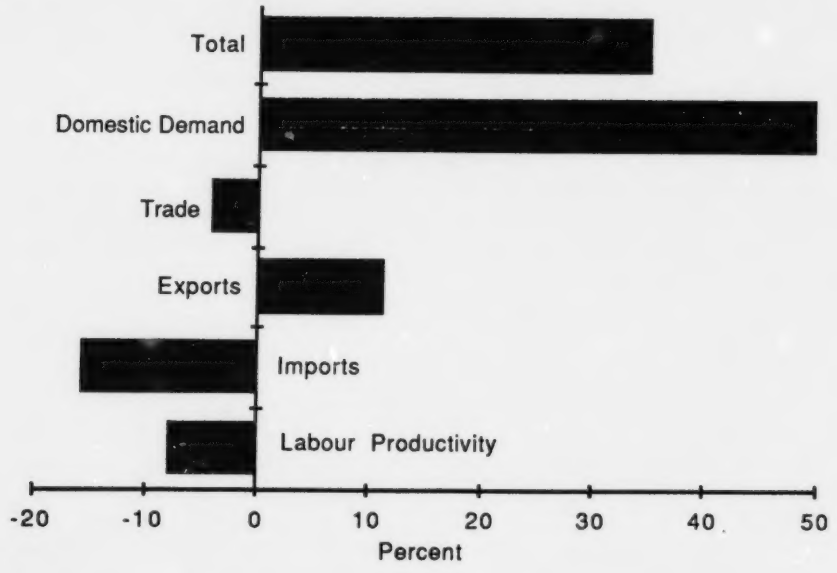
Percent Change in Employment by Major Sectors, Canada, 1971-1981



Source Statistics Canada, Input-Output Division, Special Tabulations.

Chart 2-2

Percent Change in Employment Requirements by Major Factor, Canada, 1971-1981



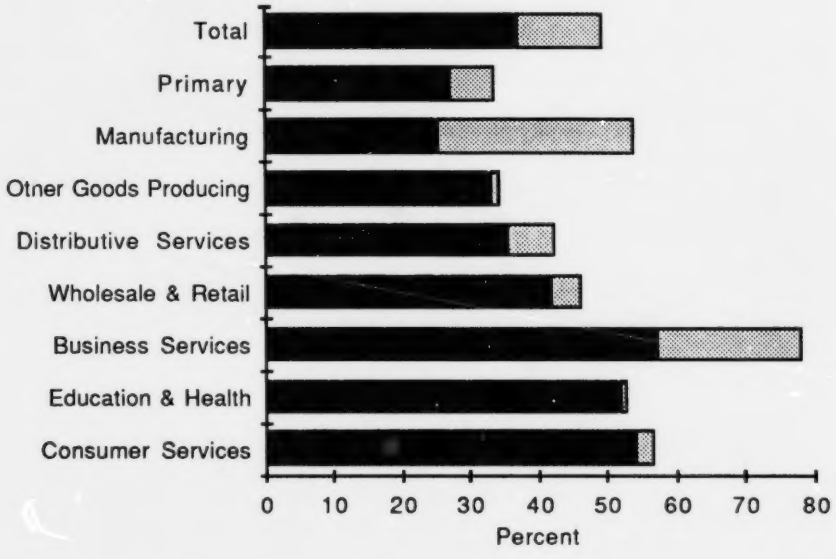
Source Statistics Canada, Input-Output Division, Special Tabulations.

2.2 Domestic Final Demand

As domestic final demand was the greatest contributor to the increase in employment requirements between 1971 and 1981, a further breakdown is required. As shown in Chart 2-3, it is again the Business and Consumer Services sectors which had the largest increase in employment due to an increase in domestic final demand. This was followed closely by Education and Health[2] and Manufac - turing. (See Table 2-1).

Chart 2-3

Percent Change in Industrial Employment Requirements due to Domestic Demand, Canada, 1971-1981



Source Statistics Canada, Input-Output Division, Special Tabulations.

The domestic final demand for manufactured goods (either imported or domestically produced) rose rapidly over the 1971-81 period, resulting in a 54% increase in employment requirements, although more than half of this was met by imports (see the hashed area in Chart 2-3 and for a more detailed examination, appendix Table A-2). By excluding that portion of final demand met by imports, it provides us with a more accurate view of the direct effect of final demand changes on domestic industries over the period. The rise in domestic final demand was offset, as we will see later, by a drop in requirements due to changes in trade, to increases in labour productivity, and changes in the technology and market share matrices. A more detailed industrial breakdown of employment growth due to changes in domestic final demand can be found in appendix Table A-1.

2 Note that this includes only the Commercial Services component of the Health and Education sectors (i.e., private schools, doctors offices, etc.). It excludes the largest parts of both sectors (hospitals, public schools, etc.).

Table 2-1

Percent Change in Employment Requirements by Major Factors and by Industries (Small Aggregation), Canada, 1971-1981

			Percent Change in Employment Requirements due to:					
	Employ. in 1971	Total Percent. Change in Employ.	Change in Imports 1	Change in Exports 2	Net Change in Trade	Change in Domestic Final Demand 3	Change in Labour Produc-tivity 4	Change in Technol.. & Market Share Mat.
Primary	704.5	7.4	-8.8	12.7	3.9	33.9	-11.9	-18.5
Manufacturing	1,637.2	13.0	-34.2	20.0	-14.2	54.2	-16.1	-10.9
Other Goods Producing	622.3	26.0	-2.0	2.6	0.6	34.4	-7.6	-1.5
Distributive Services	520.6	31.0	-9.2	13.6	4.4	43.1	-20.9	4.3
Wholesale and Retail	1,273.8	44.4	-5.4	5.2	-0.2	46.4	2.6	-4.3
Business Services	604.0	86.1	-25.6	15.6	-10.0	78.8	-13.3	30.6
Education and Health	77.3	52.3	-1.2	2.4	1.2	53.1	-2.1	0.1
Consumer Services	501.8	76.8	-3.4	2.2	-1.2	57.0	19.4	1.7
Total	5,941.6	35.3	-15.6	11.4	-4.2	49.8	-7.7	-2.6

1 Estimated using job-output ratios (labour productivity) of Canadian industries,

2 Includes some increase in the demand for imports as intermediate inputs in the production of exports as well as the demand for domestically-produced goods and services as intermediate inputs.

3 Includes increase in domestic demand for imports as well as domestically-produced goods and services.

4 As indicated by change in the job-output ratios.

Source Statistics Canada, Input-Output Division, Special Tabulations.

2.3 Trade

For the overall purposes of examining changes in trade and its labour adjustment implications for national policy formulation, and given the present state of data availability, the Institute for Research on Public Policy (1984) recommended that some form of decomposition be applied over other methodologies, such as employment balance studies and labour tracking studies. While noting the many shortcomings of the approach, they argue that placing the changes in employment due to trade within the context of changes in employment due to other factors is an advantage. They also note that the inclusion of inter-industry effects (as used in the input-output methodology) is desirable.

Pearson and Salembier (1983) reviewed trade employment balance studies in testing the factor endowment theory of trade, and reviewed the many problems in using this approach alone for the analysis of trade-induced labour adjustment policies. They concluded that it is important to recognize that efficiency, and not necessarily employment is the stuff of gains from trade.

It is stressed that as indicated in the review by Pearson and Salembier (1983), the decomposition approach used here has many shortcomings when attempting to interpret the results as a measure of the causal influence of changes in trade on employment. Notably, this approach implicitly views imports as displacing domestic jobs. This is not necessarily true, since many of the jobs embodied in the rise in imports may not have in fact materialized had these commodities been produced in Canada. The domestic demand for a commodity is related to its price, and some imports may be produced more cheaply and efficiently elsewhere due to

other countries' comparative advantage. To some unknown extent, these lower priced imports expand consumption, and hence are not at the expense of domestic production. But this is beyond the scope of this report.

Also many imports have employment creating effects. When a nation obtains imports at lower than domestic costs, this enables a strengthening in demand (and employment) for other products. And, increased trade produces employment related effects by enlarging the capacity of both importers and exporters to carry out trade (see Salant, 1978). These positive employment benefits are not captured in the Input-Output model.

Thus, the job-displacing effects of imports are overestimated in this analysis, and hence the negative effects of change in trade on employment are overestimated. If one were to produce a range of estimates of the job displacement effects of imports during the 1971-81 period, the estimates contained here would likely represent the maximum.[3]

Hence, a negative growth rate in some industries or occupations associated with the number of hypothetical jobs embodied in the rise in imports (had all these commodities been produced in Canada) outstripping the number of jobs embodied in the rise in exports (ie., a negative change in employment requirements due to change in trade) cannot be construed as a precise measure of jobs lost to the Canadian economy due to changes in trade.

In spite of these shortcomings, the results provide crude first-order estimates of the importance of changes in trade on employment in various industries. Our result reveal that Distributive Services and the Primary sectors (notably Agriculture, Forestry and Fishing) experienced positive growth in employment requirements due to trade over the 1971-81 period. (See Chart 2-4) Furthermore, the specific Manufacturing industries in which employment requirements rose due to change in trade were those which process natural resource output, notably Food and Beverage industries, Wood industries, Paper industries, and Petroleum and Coal Products industries (See appendix Table A-1).

The remaining industries which increased employment requirements due to trade are also related to Canada's natural resource base, those being Electric Power, Gas and Other Utilities, and Transportation and Storage. In the latter case, the gains were probably largely due to the use of transportation as an intermediate input to industries in which employment gains were experienced due to changes in trade. Thus, all industries for which employment requirements rose over the decade due to change in trade were related to Canada's natural resource base, where Canada's comparative advantage in international trade lies. In these natural resource-related industries, there was an increase of employment requirements of about 90,000 due to changes in trade over the decade.

Using a somewhat different input-output model approach, Postner (1975) compared factor content of exports with that of imports for Canada to address the issue of comparative advantage of the country. He also found that Canada's

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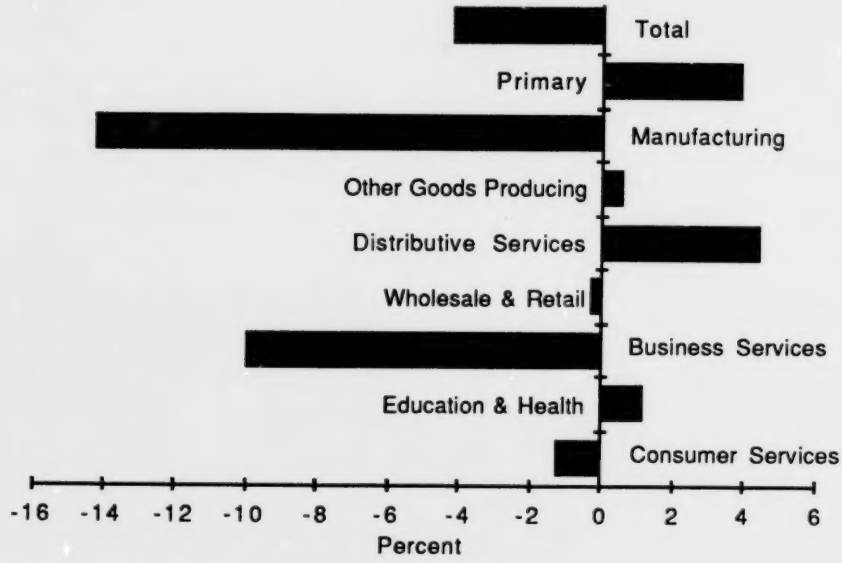
[3] A word of caution also applies to exports. Not all exports generate employment, as some imports are used in the production of exports. To see the effects of exports on employment when their import component is excluded, refer to appendix Table A-2.

comparative advantage in international trade is her factor endowment of natural resources.

Chart 2-4

Percent Change in Industrial Employment Requirements due to Trade, Canada, 1971-1981



Source Statistics Canada, Input-Output Division, Special Tabulations.

As for the Manufacturing sector as a whole, employment requirements declined 14% due to changes in trade over that same period. This is equivalent to some 230,000 jobs and is in keeping with preliminary findings of an earlier study by Robertson and Grey (1986), in which they concluded that "the net effect of trade was a reduction in employment in these 13 industries (selected Manufacturing industries) of almost 200,000 between 1967 and 1981". This is, however, markedly different from the American experience.

In a similar input-output analysis conducted on American data, Lawrence (1983) found that changes in trade had a negligible effect on employment requirements in the U.S. Manufacturing sector between 1970 and 1980, reducing employment requirements by a negligible 1%, or 10,000 jobs, as compared to 14% in Canada. Others, such as Frank (1977) and Krueger (1980) arrived at basically the same conclusions, but for different time periods. These comparisons between American (Lawrence) and Canadian experience are valid, since both use a similar input-output approach. Both, however, probably overestimate the negative effects of imports on domestic job requirements.

The manufacturing industries which experienced the largest reduction in employment requirements due to changes in trade over the 1971-81 period were the Machinery Industries (-62%), Electrical Products (-41%), Miscellaneous Manufacturing (-53%), and the Leather Industry (-26%) (See Table A-1 of the Appendix).

2.4 Trade Effects in Different Periods

The period selected affects the results obtained in any analysis such as this, particularly the results concerning the *changes in trade* factor. This is simply because trading patterns can change relatively quickly. To examine this, alternative periods (1969-79 and 1975-81) were selected and the changes in employment requirements due to changes in trade over these periods determined.

Between 1971 and 1981, the I-O analysis indicates employment requirements for the economy as a whole fell by 249,000 due to changes in trade, most of which (234,000) was accounted for in Manufacturing. The results for the other periods are as follows: 1969-79, decline in total employment requirements of 195,000, with 271,000 in Manufacturing; 1975-81, decline in total employment requirements of 94,000, with 23,000 in Manufacturing. Thus, all periods indicate a decline in employment requirements due to changes in trade, but the magnitude varies substantially, with the late 1970s and earlier 1980s indicating less of a decline than earlier periods. Some of this decline in employment requirements may be due to the fact that the production processes used to produce the kinds of goods Canada imports are more labour intensive than those used in the production of exports. Hence, even if the same dollar amounts were exported as imported, the job content of imports would exceed that of exports. This was not examined in this study, however.

2.5 Labour Productivity

Overall, this analysis suggests the economy could produce the same level and mixed output in 1981 as in 1971 with 8% fewer workers due to changes in labour productivity over that period. Most of this change would have occurred early in the decade, as labour productivity growth slowed considerably during the 1970s. Of course, employment actually rose during the period due to the rise in final demand for goods and services.

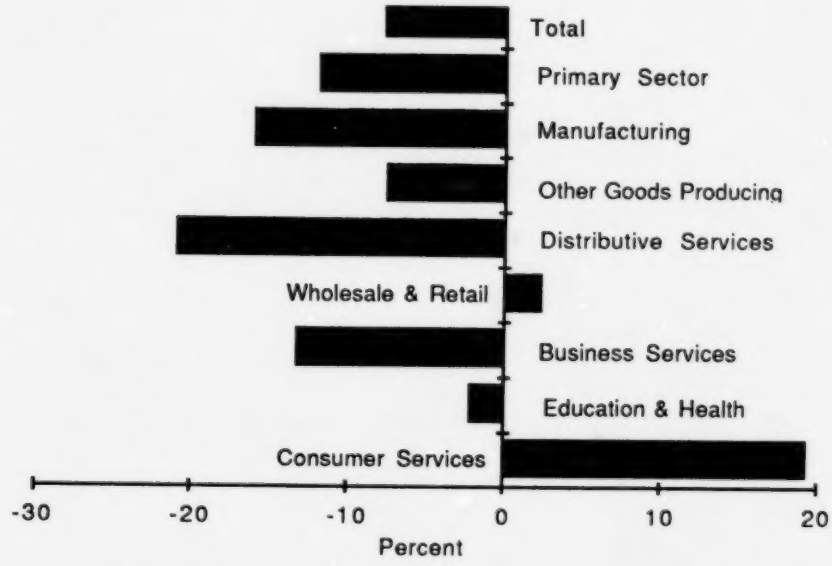
Looking at the aggregate sectors, Business and Distributive Services experienced the largest percent decline in employment requirements due to increase in labour productivity. (See Table 2-1). But declines in the same factor in the Consumer Services sector resulted in increases in employment requirements, rather than decreases as in all other major sectors. This contributed significantly to the rapid rise in employment in this sector, as consumers appeared willing to increase their consumption of output from this sector as rapidly as from others in spite of the more rapid increase in price from this sector. (See Magun, 1982).

In input-output analysis, it is assumed that measures of output and labour productivity are comparable among all industries and sectors. There are, however, numerous practical problems in measuring output in the commercial services

sector[4] in constant dollars. There are in places conceptual problems in identifying exactly what constitutes the output of a sector (such as the banking and financial sector), and issues in obtaining reliable data to measure concepts which are quantifiable. As well, there are problems of arriving at reasonable and accurate deflators to convert current to constant dollar output. These problems are well known and will not be discussed in detail here. The reader should bear in mind, however, that there is some unknown error in the measures of output, and hence productivity (which is in constant dollar output divided by employment), and that comparisons among industrial sectors should be viewed as giving an indication of the movement of employment changes, not a precise calculation.

Chart 2-5

Percent Change in Industrial Employment Requirements due to Labour Productivity, Canada, 1971-1981



Source Statistics Canada, Input-Output Division, Special Tabulations.

[4] The commercial services sector comprises of the following:

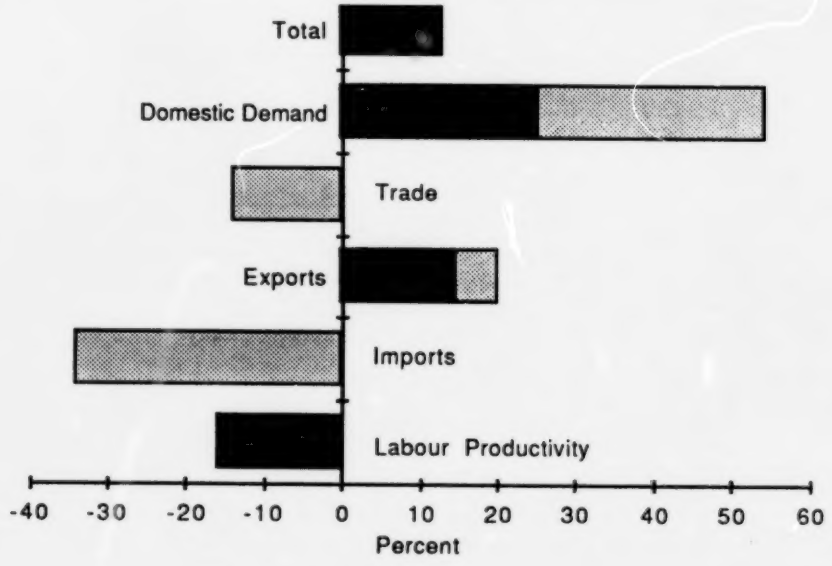
a) Distributive Services: Transportation, Storage and Communications;
b) Trade: Wholesale and Retail Trade;
c) Business Services: Services to Business Management, Finance, Insurance and Real Estate;
d) Consumer Services: Amusement and Recreation Services, Accomodation and Food Services, Personal and Miscellaneous Services;
e) Education and Health Services : this sector includes only a small proportion of the total Education and Health Services sector; that which provides commercial services, such as doctors and health care offices and private schools. It excludes hospitals, all publicly-supported schools, and other publicly-financed institutions.

2.6 Manufacturing Sector

Manufacturing as a whole is set apart from other sectors mainly because of the relatively large decline in employment requirements due to changes in trade (-14% as compared to -4% for the entire commercial economy), relatively large decline in employment requirements due to positive changes in labour productivity (-16% compared to -8%, for the entire commercial economy), and relatively large employment requirement declines due to changes in the technology and market share matrices (-11% compared to -3%, for the commercial economy).

Chart 2-6

Percent Change in Manufacturing Employment Requirements by Major Factor, Canada, 1971-1981



Source Statistics Canada, Input-Output Division, Special Tabulations.

Thus, it was not a slower growth in domestic final demand for manufactured goods that resulted in a slower growth of this sector. (see Chart 2-6). However, as we have seen previously, much of this demand was met by imports (see hashed areas of the chart).

2.7 Fastest and Slowest Growing Manufacturing Industries

In terms of labour adjustment, it is of interest to know what role each of the four factors listed earlier played in determining which industries are fastest and slowest growing. Jobs were being created at a rapid rate in the industries with the highest employment growth and worker displacement and permanent job loss was most likely to take place in industries with declining employment. In terms of the

factors, what distinguished these two groups of Manufacturing industries during the 1970's? Was it due to changes in trade, changes in labour productivity or changes in domestic final demand?

Table 2-2 shows the percentage change in employment requirements between 1971 and 1981 for the 39 declining industries and for the 30 fastest growing industries (in the aggregate) and the decomposition of this percent change into changes due to each factor. These are weighted (by employment) averages of the growth in employment requirements due to each factor for these two groups.

Table 2-2

Percent Change in Employment Requirements of Fastest Growing and Declining Manufacturing Industries, Canada, 1971-1981

	Total % Change in Employment	Percent Change in Employment Requirements due to: Change in Imports 1	Change in Exports 2	Net Change in Trade	Change in Domestic Final Demand 3	Change in Labour Productivity 4	Change in Technol. & Market Share
Declining	-12.0	-17.2	4.4	-12.8	31.1	-18.2	-12.0
Fastest Growing	46.4	-62.4	36.0	-26.4	92.3	-10.3	-9.2
Total Economy	13.0	-34.2	20.0	-14.2	54.2	-16.1	-10.9

1 Estimated using job-output ratios (labour productivity) of Canadian industries,
2 Includes some increase in the demand for imports as intermediate inputs in the production of exports as well as the demand for domestically-produced goods and services as intermediate inputs.
3 Includes increase in domestic demand for imports as well as domestically-produced goods and services.
4 As indicated by change in the job-output ratios.

Source Statistics Canada, Input-Output Division, Special Tabulations.

The major difference between the fastest growing and declining industries appears to be the differences in growth of domestic final demand for the commodities produced by those industries. Overall growth in domestic final demand was close to three times as high in the fastest growing than in the declining industries. Much of this demand was, however, met by imports.

Growth in employment due to change in domestic final demand for *domestically* produced goods (excluding imports) was approximately 30% in the fastest growing industry and 14% in the slowest, a difference of a factor of two. But export growth was also higher in the aggregate in the fastest growing group.

Thus, changes in employment requirements due to changes in both exports and imports were much higher among the fastest growing than in the declining industries, and the net decline due to trade was higher in the fastest growing industries. This decline due to trade was, however, compensated by a somewhat greater decline in employment requirements due to changes in labour productivity in the declining industries.

Overall, the major differentiating factor was domestic final demand. Changes in trade, if anything, more negatively affected the fastest growing than the declining industries. It must be stressed that this is for the two groups in the aggregate. The importance of each factor varies enormously among selected industries (See appendix Table A-3).

2.8 Restructuring of Industrial Employment

Up to this point, the analysis has concentrated on the underlying factors associated with an industry's or sector's growth on employment between 1971 and 1981. Of course, a variation in growth rates among industries produces a change in the employment structure (or distribution). The purpose of this section is to attempt to decompose this change in the employment structure into that due to each of the factors reviewed previously.

The structure of employment is represented by the percent distribution, and the change in the structure is measured by the change in the distribution, or for a particular undustry, its *change in share of employment.* For the four underlying factors, the important consideration is the variation among industries in the growth rate of employment due to that factor. If the employment in all industries grew at approximately the same rate due to a specific factor, then that factor will not contribute to a restructuring of employment. In this section, the change in share (a measure of restructuring) due to each factor allows us to determine its contribution to structural change. The derivation of these calculations is given in Appendix B.

Table 2-3 indicates that the Services sector increased its share of employment by 7.7 percentage points over the decade at the expense of the Goods-Producing sector.[5] This I-O analysis suggest change in the *market share* and *technology* matrices were largely responsible, contributing over one third of the total change. A change in the technology matrix can be interpreted as a shift in the demand for intermediate inputs towards the types of commodities and services produced by the Services sector, rather than those produced by the Goods-Producing sector. A change in the market share matrix can be interpreted not as a change in the type of commodities and services produced, but rather as a shift in the industry group in which they are produced, towards the Services sector and away from the Goods-Producing sector. Together, these can be loosely interpreted as meaning a greater share of the input used to produce the economy's output were produced in the Services (as opposed to Goods-Producing) sectors in 1981 than in 1971, and there may have been a shift in the location of production of some services and commodities towards the Services sector. These observations are consistent with the hypotheses that Information and Management Services are more important inputs now than in previous periods, and that the production of some services may simply have moved from within firms in the Goods-Producing sector to consulting

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5 This is somewhat different than the results from household surveys (Census and Labour Force), which indicate that the Service sector gained a 4 percentage point share.

firms in the Services sector. More detailed analysis would be necessary to assess these hypotheses more carefully. (See Grignon and Moray, 1985).

Beyond these changes, differences between the two sectors in labour productivity growth (more rapid in the Goods-Producing sector) was the next most important, contributing one-quarter of the total change in share. More rapid growth in domestic final demand for services rather than for goods contributed one-fifth of the total structural shift. Differences between the two sectors in the effect of changes in trade was the least important factor in the structural shift in employment towards the Services sector. But this is simply the results for the two large sectors. It may be of more interest to determine the role of each factor for smaller sectors.

Table 2-3

Change in Share of Employment by Factor and Major Sectors, Canada, 1971-1981

	Total Change in Share	Change in Share due to: Net Change in Trade	Change in Domestic Final Demand	Change in Labour Productivity 2	Change in Technology & Market Share
Goods-Producing	-7.7	-1.0	-1.7	-2.1	-3.0
Services	7.7	1.0	1.7	2.1	3.0
Primary	-2.4	0.7	-1.4	-0.4	-1.4
Manufacturing	-4.6	-2.1	0.9	-1.7	-1.7
Other Goods Producing	-0.7	0.4	-1.2	0.0	0.1
Distributive Services	-0.3	0.6	-0.4	-0.9	0.5
Wholesale and Retail Trade	1.4	0.6	-0.5	1.6	-0.3
Business Services	3.8	-0.4	2.2	-0.4	2.5
Education and Health	0.2	0.1	0.0	0.0	0.0
Consumer Services	2.6	0.2	0.5	1.7	0.3

1 Includes increase in domestic demand for imports as well as domestically-produced goods and services.

2 As indicated by change in the job-output ratios.

Source Statistics Canada, Input-Output Division, Special Tabulations.

As indicated in Table 2-3, the Primary sector's share of employment fell by 2.4 percentage points. This was primarily due to lower than average rise in domestic demand for commodities produced by the sector (contributing a 1.4 percentage points decline in share) and to the changes in the structural matrices (technology and market share) between the two years. Changes in trade in general, however, tended to increase the sector's share of total employment.

In the Manufacturing sector, which had a large decrease in total employment share of 4.6 percentage points, the change is mostly attributable to changes in trade (2.1 percentage points), followed by changes in labour productivity and changes in the residual terms (technology and market share matrices). Since it is the deviation in the employment growth due to trade from that of the total economy that is impor - tant, and since most sectors outside Manufacturing and the Primary sector do not trade, any decline in employment requirements in Manufacturing due to trade will

have a large effect on its employment share. This appears to be what has happened over the decade.

The Business Services and Consumer Services sectors are interesting. While Business Services increased its share of total share of employment due to changes in the technology and market share matrices and domestic demand, the Consumer Services increased its share mainly because of a change in labour productivity.

For the commercial economy as a whole, the significance of each of the four factors in the total redistribution of employment is measured according to the total movement in the distribution due to each factor, but not its direction (ie., whether it tended to decrease or increase an industry's share of employment).

Using this approach, of the total restructuring of employment among the 39 industries (medium level of I/O aggregation), 37% was due to variation in growth in domestic demand among industries, 23% to variation in growth in labour productivity, 22% to changes in the technology and market share matrices, and 18% to variations among industries in the employment effects of changes in trade. Thus, variations in domestic final demand is the major contributor to employment restructuring. Even though many industries do not trade, their share of employment can rise due to changes in trade if the industries employment remained constant, but the overall effect of changes in trade was to reduce employment requirements in the entire commercial economy (through large declines in other trading industries).

But the issue of the effect of trade on employment redistribution is probably more meaningful when examined for a section within which all industries might trade. For this reason, and because of the high degree of interest in what is occuring in Manufacturing in Canada, this exercise was conducted for the Manufacturing sector alone and broken down into 122 industries (using large level of I/O aggregation).

The results indicate that of the total restructuring among the 122 Manufacturing industries, between 1971 and 1981, 39% was due to changes in domestic final demand, 25% due to changes in trade, 16% due to changes in labour productivity and 21% due to the residual term, which includes changes in the technological coefficients and market share matrices. Thus, change in domestic final demand was most strongly associated with the restructuring of Manufacturing employment over the decade.

Changes in the levels of imports and exports also had a strong influence on the employment structure as it tended to increase employment requirements in some industries and reduce it in others. Variations among Manufacturing industries in productivity growth was less associated with the redistribution than the other factors.

3 Changes in Occupational Employment

3.1 Growth in Occupational Employment

Before considering the decomposition of occupational employment growth, a brief review of the actual change between 1971 and 1981 will be presented. Three levels of occupational data are used here, the 81 3-digit levels, the 22 2-digit levels and a further aggregation to 7 levels.[1]

At the most highly aggregated level (7 occupational groupings), the growth rate in employment was highest for Management, Highly Qualified (roughly requiring a post-secondary education) and other White Collar jobs, and lowest in the Blue Collar and Trade occupations. (See Chart 3-1 and Table 3-1 on the following page) Within these broad aggregates, there was substantial variation in growth rates within individual occupations (see Tables A-5 and A-6, in the Appendix), but in general, employment in Managerial and Highly Qualified occupations recorded the fastest growth, followed by Clerical, Sales and Service occupations, while Blue Collar and Trades occupations demonstrating the slowest growth. Thus, there was a redistribution or restructuring of employment away from Blue Collar occupations towards Managerial and Highly-Qualified. (See also Foot and Meltz, 1985) But what events on the demand side of the economy were related to this variation in growth and redistribution of occupational employment?

To help answer this question, change in employment by occupation will be decomposed into the same factors as in the decomposition used in industrial employment (trade, domestic final demand, labour productivity and technology/market share matrices). One further factor is considered for occupations. By using an industry/occupation matrix, employment by occupation is linked to industry employment. This is simply a matrix of the occupational distribution within each industry. This can be viewed as an indication of the mix of skills (or types of labour) used to produce the industry's output at a given point in

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1 Only employment in the commercial sector of the economy is included in this study. Thus, the changes in employment growth for occupations partially or largely seated in the non-commercial sector (e.g., Teaching, Nursing, Government Administration, etc.) are not representative of the occupation as a whole, but only that portion employed in the commercial services sector. The following industries have been excluded from the industry/occupation matrix since they are in the non-commercial sector: Hospitals and Related Health Care Institutions (SIC 821 and 822), Welfare Organizations (828), Religious Organizations (831) and all Public Administration (902 to 991). Thus, all occupations in these industries are excluded. As well, only private schools in the Education Services sector are included in this analysis, and it is assumed that the occupational distribution within this commercial component of the Education sector is identical to that for the sector as a whole.

time. Thus, in this case, a change in the industry/occupation matrix between 1971 and 1981 represents an additional factor to be used for decomposition purposes[2].

Table 3-1
Percent Change in Employment Requirements by Factors and Major Occupations, Canada, 1971-1981

	1971 Employ-ment (000's)	Total % Change in Employ-ment	Percent Change In Employment Requirements du to: Net Change in Trade	Change in Domestic Final Demand 1	Change in Labour Produc-tivity 2	Change in Technol. & Market Share	Change in Skill Mix
White Collar/Professional	2941.1	55.3	-8.6	57.9	-4.2	2.7	3.6
Blue Collar	3000.4	15.7	-3.6	41.9	-11.1	-7.9	-3.5
Management	252.0	117.2	-10.5	88.0	-16.8	4.9	51.6
Highly Qualified	322.4	75.4	-10.2	75.7	-13.4	8.0	15.2
Clerical/ Sales	1,797.9	42.0	-3.7	52.2	-5.6	1.2	-2.1
Services	568.8	58.7	-22.2	52.4	11.1	3.7	-6.3
Primary Sector	640.2	0.4	3.9	28.9	-12.6	-14.3	-5.5
Processing/ Const.	1,639.2	22.0	-6.0	45.0	-10.6	-6.4	0.1
Mahining/ Transp.	597.7	20.1	-5.1	48.6	-11.9	-6.2	-5.2
Not Classified	123.3	-10.3	-4.4	35.4	-5.6	-3.0	-32.7
Total	5,941.5	35.3	-4.2	49.8	-7.7	-2.6	0.0

1 Includes increase in domestic demand for imports as well as domestically-produced goods and services

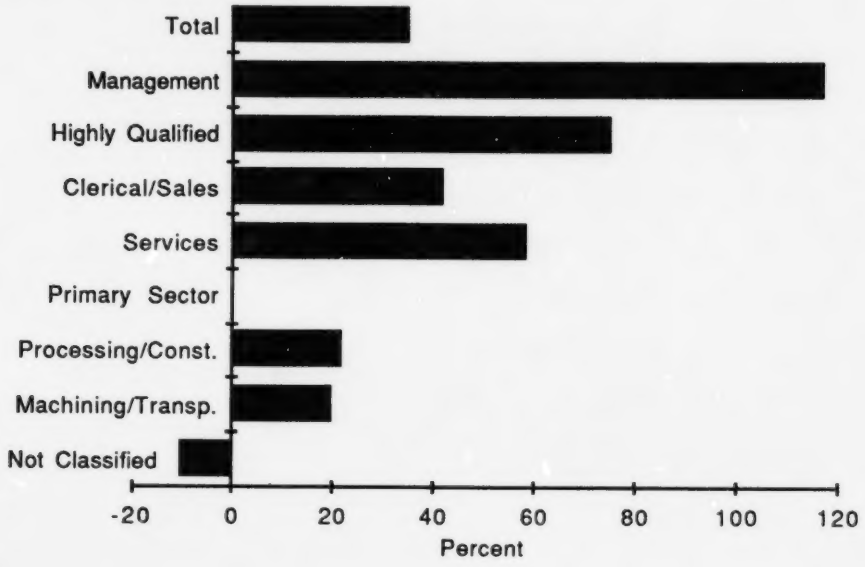
2 As indicated by change in the job-output ratios.

Source Statistics Canada, Input-Output Division, Special Tabulations, and 1971 and 1981 Censuses.

2 The caveats mentioned earlier apply here also, particularly the fact that this methodology captures only the direct effects of the factors on employment growth. It does not capture interaction effects.

Chart 3-1

Percent Change in Employment by Major Occupations, Canada, 1971-1981



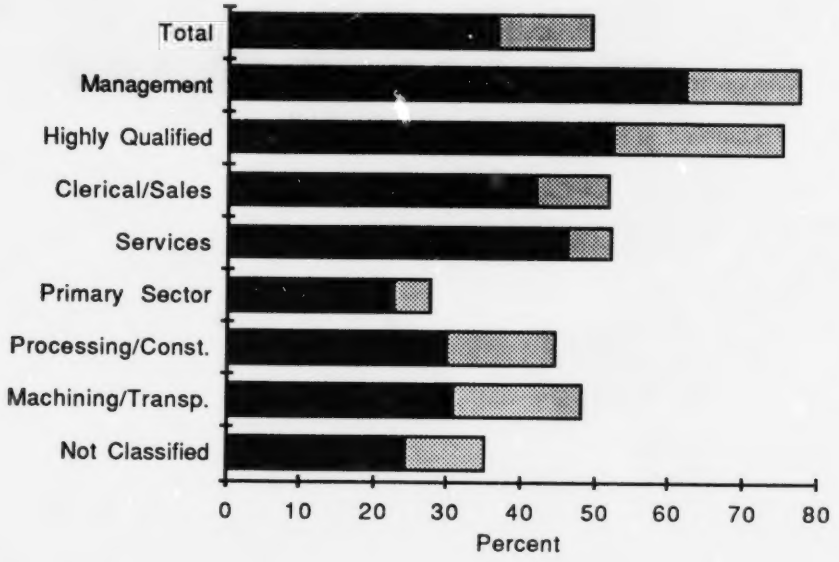
Source Statistics Canada Census Data.

3.2 Domestic Final Demand

Growth in domestic final demand was the principal factor influencing the growth in employment requirements for every occupational group. It contributed to above-average growth in employment requirements in Management and in Highly-Qualified occupations, and below-average growth in the Primary Sector occupations (Farming, Fishing, Forestry) (see Chart 3-2 and Table 3-1). But much of this rise in domestic demand was met by imports (the hexed section of the bars of Chart 3-2). When only domestic final demand met by domestic industries is considered (ie., excluding that domestic demand met by imports -- the solid black on Chart 3-2), the most rapid growth in employment requirements in Canada due to this factor was in the Management, Highly-Qualified, Clerical/Sales and Services occupations.

Chart 3-2

Percent Change in Employment Requirements due to Domestic Final Demand by Major Occupations, Canada, 1971-1981



Source Statistics Canada, Input-Output Division, Special Tabulations and 1971 and 1981 Censuses.

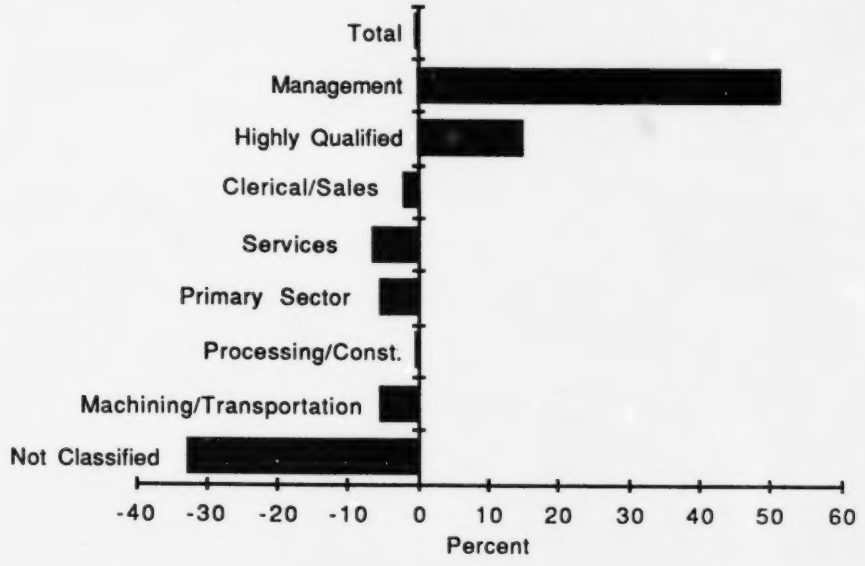
The growth in employment requirements due to growth in domestic final demand for the Blue-Collar occupations (Fishing, Forestry, Processing, Construction, Machining, etc.) in Canada was, however, much lower. Thus, the variation across occupations in the growth of employment requirements in Canada due to domestic final demand was substantial. Generally the White-Collar (Professional, Mana - gerial, Service) occupations benefitted more from this growth than the Blue-Collar occupations. The growth in employment requirement due to domestic final demand and other factor for 81 detailed occupations is shown in appendix Tables A-5 and A-6.

3.3 The Changing Skill Mix Within Industries

Another very important factor in understanding the growth and variation in growth of employment in occupations is changes in the mix of skills employed within industries. There was a general movement over the decade towards increased use of Managerial and Highly-Qualified people within industries and towards relatively fewer Blue-Collar workers. Thus, this changing skill mix contributed to growth in employment requirements in Management and in the Social and Natural Sciences and detracted from employment growth people in occupations such as Mining, Machining, Material Handling, Construction, Processing, as well as Sales and Services. (See Chart 3-3 and Tables 3-1, A-5 and A-6).

Chart 3-3

Percent Change in Employment Requirements due to Change in Intra-Industry Mix of Skills, by Major Occupations, Canada, 1971-1981



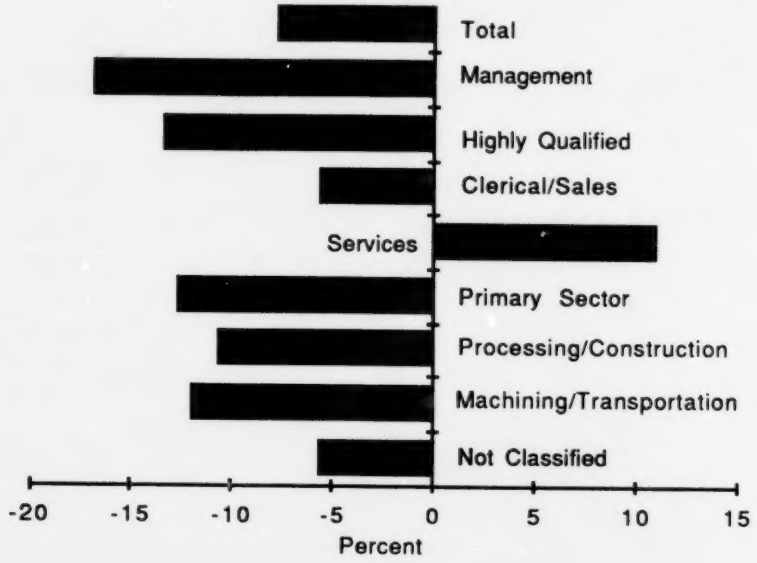
Source Statistics Canada, Input-Output Division, Special Tabulations and 1971 and 1981 Censuses.

3.4 Labour Productivity

Increases in labour productivity can indirectly increase employment by increasing individuals' wealth and firms' profits; this may translate into increased demand for goods and services, and hence employment. But these indirect effects are not captured here. Only the first-order effect of productivity change -- that of requiring fewer workers to produce the same amount of output -- is captured in this model. Viewed in this way, there was not a lot of variation among broad occupational groups with regards to the effect this factor had, with one notable exception. Only in the Services occupations did employment requirements actually rise as a result of changes (in this case, a decline) in labour productivity. (See Chart 3-4 and Tables 3-1).

Chart 3-4

Percent Change in Employment Requirements due to Labour Productivity by Major Occupations, Canada, 1971-1981



Source Statistics Canada, Input-Output Division, Special Tabulations and 1971 and 1981 Censuses.

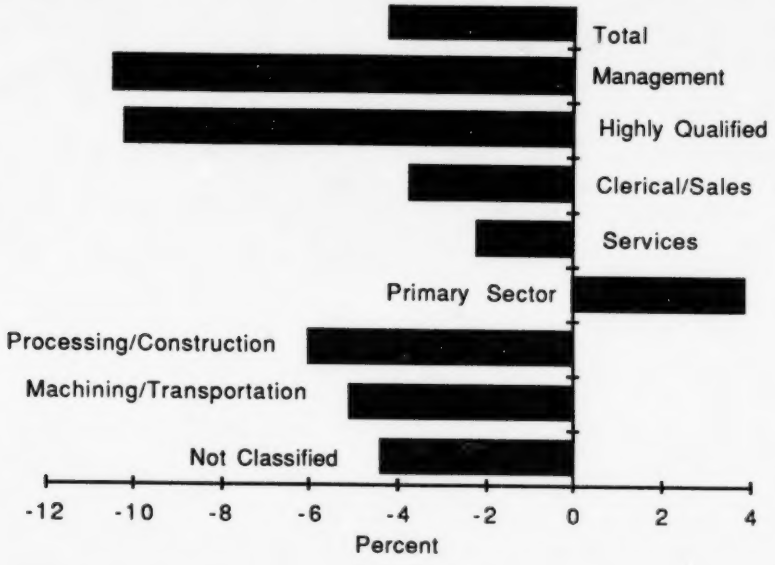
3.5 Net Changes in Trade

The difficulties in interpreting the effect of changes in trade, in particular the effect of imports on the growth of employment requirements also apply here. Even though the effects of imports on employment requirements are likely overstated in this methodology, changes in trade plays the smallest role in the growth in employment requirements for occupational groups of all the factors discussed here.

As can be seen on Chart 3-5, for major occupational groups Management and Highly-Qualified occupations had the largest decline in employment requirements due to changes in trade, while the Primary Sector occupations were the only ones where employment requirements increased as a result of this factor.

Chart 3-5

Percent Change in Employment Requirements due to Changes in Trade, by Major Occupations, Canada, 1971-1981



Source Statistics Canada, Input-Output Division, Special Tabulations and 1971 and 1981 Censuses.

The relatively good performance of the Blue-Collar occupations confirms a previous observation that growth of employment requirements due to trade were in the resources industries. Many of Canada's Blue Collar workers are in fact to be found in such industries.

At the more detailed level of 81 occupations, those for which employment requirements grew the most because the rise in exports exceeded the rise in imports over the decade included Fishing, Forestry/Logging, Wood Processing, Life Sciences occupations and the Air, Railway, Water and Motor Transportation occupations. (See Table A-6) This latter group probably benefitted from the intermediate services they provide to industries which export directly.

3.6 The Fastest Growing and Declining Occupations

There are two groups of occupations which are of special interest; these are occupations for which employment increased rapidly and those in which employment grew slowest or declined. Worker displacement and permanent job loss would have occurred much more frequently among the slowest growing and declining occupations (ie., those with declining employment levels) than among others.

But what distinguished the occupations with high rates of job creation from those with very slow growth or net job loss? Was it the effect of changes in trade over the decade, was it the effect of differences in productivity growth, changes in the

skill mix employed within industries, or the influence of variations in domestic final demand?

To answer these questions, the 20 fastest and the 20 declining or slowest growing occupations were selected from the group of 81 3-digit occupations and the weighted (by employment in the occupation) average of the change in employment requirements due to each factor determined for the two groups. The summary results are shown in Table 3-2 below.

Table 3-2

Percent Change in Employment Requirements of Fastest and Declining Occupations, Canada, 1971-1981

	1971 Employ-ment (000's)	Total % Change in Employ.	Percent Change in Employment Requirements Due to: Net Change in Trade	Change in Domestic Final Demand 1	Change in Labour Produc-tivity 2	Change in Technol. & Market Share	Change in Skill Mix
Declining	805	111.5	-5.7	79.5	-7.0	3.0	41.7
Fastest Growing	1,503	-1.4	-2.3	35.2	-11.3	-8.3	-14.7
All Occupations	5,942	35.3	-4.2	49.8	-7.7	-2.6	0.0

1 Includes increase in domestic demand for imports as well as domestically-produced goods and services

2 As indicated by change in the job-output ratios.

Source Statistics Canada, Input-Ouput Division, Special Tabulations and 1971 and 1981 Censuses.

It is evident that the major differences between the groups are related to domestic final demand, and the changing mix of skills within industries. The major differentiating factor between the groups of fastest and slowest growing occupations is the change over the decade in the types of labour required within industries to produce their output. This may be related to technological change, changes in production processes, or changes in the types of information needed to operate firms. Occupations which have large gains in employment requirements due to this restructuring within industries are likely to be in the fastest growing group.

Changes in trade and their influence on employment requirements are not markedly different between the two groups. In fact, the employment requirements fell more due to this factor in the fastest growing than in the declining groups. Change in productivity had a slightly negative influence (ie., productivity gains were greater) on the fast growing than on the slow growing group. Thus, rapid growth in labour productivity was not largely responsible for delegating occupations to the slowest growing groups.

These observations do not mean that in particular cases changes in productivity and trade over the decade did not have a marked effect on particular occupations, but these occupations were just as likely to be among the fastest growing as declining industries. For details as to the importance of each factor in the employment growth or decline of particular occupations, see Table A-7.

3.7 Restructuring of Occupational Employment

Up to this point, the emphasis in the analysis of occupational employment has centered on the growth in employment. But there is much concern about the restructuring of occupational employment.

White Collar and Professional occupations such as Management, the Highly-Qualified occupations, Clerical and Services occupations increased their share of employment over the decade, while the occupations whose share declined included most Blue Collar occupations such as Processing, Construction Trades, Primary Sector occupations, Machining, Material Handling, etc., lost ground in terms of employment shares. (See Table 3-3).

Table 3-3
Change in Share of Employment by Major Occupations, Canada, 1971-1981

	Total Change in Share	Change in Share due to Changes in:				
		Net Trade	Domestic Final Demand 1	Labour Productivity 2	Technol. & Market Share	Skill Mix
WhiteCollar/Professional	7.3	-0.2	3.0	1.3	2.0	1.2
Blue Collar/Trades	-7.3	0.2	-3.0	-1.3	-2.0	-1.2
Management/Admin.	2.6	-0.2	1.2	-0.3	0.2	1.6
Highly Qualified	1.6	-0.2	1.0	-0.2	0.4	0.6
Clerical/ Sales	1.5	0.1	0.6	0.5	0.9	-0.5
Services	1.7	0.1	0.2	1.3	0.5	-0.5
Primary Sectors	-2.8	0.7	-1.7	-0.4	-0.9	-0.4
Processing/ Cont.	-2.7	-0.4	-1.0	-0.6	-0.8	0.0
Machining/ Transp.	-1.1	-0.1	-0.1	-0.3	-0.3	-0.4
Not Classified	-0.7	0.0	-0.2	0.0	0.0	-0.5
Total	0.0	0.0	0.0	0.0	0.0	0.0

1 Includes increase in domestic demand met by imports as well as domestically-produced goods and services.

2 As indicated by change in the job-output ratios.

Source Statistics Canada, Input-Output Division, Special Tabulations and 1971 and 1981 Censuses.

What was primarily responsible for this shift from blue collar to White Collar/Professional occupations? Of the 7.3 percentage point rise in employment in the White Collar/Professional category, the largest share (3.0 points) was due to the faster growth in domestic final demand for goods and services produced by these occupations. Changes in the technology and market share matrices, which reflects primarily the more rapid growth in the intermediate demand for commodities produced by these occupations, also figured prominently in the employment redistribution contributing 2.0 of the 7.3 point shift Changes in the mix of skills employed within industries and variations in labour productivity levels (i.e., the more rapid productivity growth in industries in which Blue Collar workers are concentrated) each contributed approximately 1.2 points. Thus, the overall shift is spread over all four of these factors. Table A-8 in the Appendix provides a more detailed picture of those changes that affected the structure of occupations.

4 Conclusions

4.1 Industry Employment Changes

Overall, the level of employment growth was determined more by changes in domestic final demand than by another factor. Other factors (trade, labour productivity), however, played an important role in particular industries.

Regarding the structural shift in employment towards the services sector, a greater use of services as intermediate inputs in producing the economy's output, and the more rapid productivity growth in the Goods-Producing sector seemed to be the most important factors. However, the Services sector is large with many diverse industry groups. No single explanation applies to all groups; the factors vary in significance from one to the other. Earlier studies on the shift in employment to the Services sector generally conclude that it is the lower rate of growth in productivity in the Services sector as compared to the Goods-Producing sector that is the major reason for the more rapid employment growth in the sector (Chand, 1983 and Magun, 1982). In particular, this explanation seemed to hold during the 1950's and 1960's.

A more detailed analysis of the Services sector suggests that the factor mainly associated with the restructuring towards the Services sector during the 1970's varied depending upon the sub-sector in consideration. In the case of Consumer Services (Accommodation and Food Services, Amusement and Recreation Services, Personal and Miscellaneous Services) and Retail Trade, the low and even negative productivity growth is indeed the dominant factor in the redistribution of employment to this sector; it is not an above average growth in domestic final demand for these services that caused the employment shift. These services differ from all others in that the majority of their output (between 80 and 85%) goes directly to meet final demand by consumers or governments. For other services, a substantial portion (40% or more) of their output serves as intermediate input to other industries. (See Table A-9) In the Business Services sector (Finance/Insurance/Real Estate and Services to Business Management), the large increase in share of employment was not directly related to below-average productivity growth in the sector. Rather, a rapid increase in domestic final demand and the fact that these services increased their share of intermediate inputs to other industries accounted for most of this sector's increase in share of employment.

Another component of the Services sector -- Transportation and Storage -- did not increase its share of employment at all over the decade. Thus, the factors related to the rise in the Services sector vary depending upon which sub-sector of this very large sector one is examining.

With regards to the structural change within Manufacturing, again variations in the growth of domestic final demand among industries played the major role, but variations in the influence of changes in trade also played an important role in employment restructuring.

4.2 Displacement of Workers

It is difficult to assess the displacement of workers from studies such as this one which deal with *net* changes in employment requirements. Ideally, as pointed out in Pearson and Salembier (1983), research used for this purpose should estimate gross labour displacement within industries or sectors over time. There may be workers displaced in growth industries due to technological change, obsolescence of skills (change in mix of skills used), or for other reasons. Furthermore, it is conceivable that even within firms with slowly declining output and employment, the displacement of workers does not occur, since the decline may be handled by normal labour attrition. Such possibilities are masked when *net* changes in employment are used.

Nonetheless, the displacement of workers is more likely to occur in industries with declining employment than in those with rapidly growing employment. This being the case, it was observed that the negative influence of changes in trade on employment requirements was stronger in the fastest growing Manufacturing industries than among the declining industries.

Thus, more rapidly rising imports than exports does not necessarily lead to job displacement; it is equally likely to be associated with very rapid growth since a rise in domestic final demand does in some cases lead to both increases in imports and a rapid domestic growth in employment, at least during the 1970's.

Assuming the 39 Manufacturing industries with declining employment were representative of those from which workers were displaced during the 1970's, it is worth looking at the factors associated with the employment decline. In terms of effect on employment growth, changes in productivity levels had the largest direct negative effect, followed by changes in trade and changes in the mix of intermediate inputs (the technology matrix). Low positive growth was registered due to changes in domestic final demand. But the real question relates to why employment in these industries declined, while it was growing elsewhere; that is, why did their share of manufacturing employment decline. Viewed in this way, it is observed that this decrease in share of employment for the declining industries as a group was almost totally related to the very low growth in domestic final demand, and virtually unrelated to the other three factors[1].

4.3 Occupational Employment Changes

As with industrial employment growth, changes in domestic final demand over the decade was the single most important factor in determining the growth of employment in occupational groups. It was also one of the two major factors, along with the restructuring of occupations within industries, which largely differentiated occupations with fast growing employment from those with very slow growing or declining employment. But these are general statements; other factors played an important role for specific occupations.

The structural shift observed over the decade from Blue Collar to White Collar and Professional occupations was not due to any single factor. This I-O analysis

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[1] It is important to stress that this is a general observation, and is not necessarily applicable to all industries within the group.

indicates that of the total shift in the change in share of employment of 7.3 percentage points, approximately 40% was due to the more rapid growth in domestic final demand for commodities and services produced by the White Collar and Professional occupations and 25% due to the changes in the *market share* and *technology* matrices[2] which favored the White Collar and Professional occupations.

The remaining 35% of the overall shift was split evenly between variations in productivity levels between the two groups (ie., more rapid labour productivity in industries in which Blue Collar occupations are concentrated) and the restructuring of skills within industries towards White Collar and Professional occupations and away from Blue Collar occupations. Changes in trade had little to do with the employment restructuring towards the White Collar/Professional occupations.

But this is simply an analysis of the restructuring between two occupational groups. Within smaller and more specific groups, the role of each factor in the change in that groups share of employment will differ substantially among occupations.

It is difficult to interpret these observations in the context of the discussions on the effect of productivity and technological change on different occupations. It seems evident that domestic final demand is the most important factor in influencing the growth or employment share of most occupations. But other factors related to technology and productivity changes play an important role. For example, the shift in the mix of types of labour employed within industries may well be related to technological change and change in methods of operation and production. It may reflect a need for more white collar, professional and semi-professional skills to adopt and utilize new technologies. It may also be related to the rise in the information industries, which to itself related to technological change and change in methods of operation. Furthermore, changes in the technology matrix (ie., shifts in the demand for different types of intermediate inputs), may also reflect changes in technology and production processes. As the recipe for producing a particular type of output changes, it is reflected in the types of goods and services used as inputs. Changes in the recipe may be due to changes in technology (although it could be due to other factors such as changes in relative price). Finally, the more rapid growth in labour productivity in industries in which blue collar occupations tend to be concentrated may also be in part due to improved technology and production processes. Thus, changes in these three factors -- the technology matrix, the skill mix within industries and labour productivity -- likely to some extent reflect changes in technology and production processes, although the degree to which this is true is impossible to know using this particular methodology.

Together, these three factors accounted for approximately 4.5 of the 7.3 percentage point shift in employment shares towards the White collar/Professional group. Thus, it is likely that technological change and its effect on production

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[2] A change in the market share matrix can be interpreted not as a change in the types of commodities and services produced, but rather as a shift in the industry sectors in which they are produced towards those employing White Collar/Professionmal occupations. A change in the *technology matrix* can be interpreted as a shift in the demand for intermediate inputs towards the types of commodities and services produced by White Collar/Professional occupations, and away from those produced by Blue Collar occupations.

processes and the types of skills required played a considerable role in the restructuring of occupational employment observed during the 1970's.

In order to draw some observations regarding worker displacement and the resulting need for labour adjustment assistance, the 20 occupations (out of 81) with declining or slowest growing employment are assumed to be representative of the occupations from which worker displacement is most likely to occur. There are largely blue collar occupations, and employment fell by 1% for the group as a whole over the decade. There was a small decline in employment requirements due to changes in trade (2%), a large decline due to changes in productivity (11%) and the movement in the types of labour employed within industries away from these occupations (resulting in a 14% decline). These were offset by a 36% rise in employment requirements due to growth in domestic final demand.

But in this I-O model almost all occupations experience declining employment requirements due to productivity changes, and many due to trade and the technology and market share matrices, even fast growing occupations. The main question then is, for this group as a whole, what largely explains why they declined when others grew, or put another way, why did their share of employment fall the fastest.

The share of employment for this group fell by 7.0 percentage points between 1971 and 1981. This decline was associated largely with two factors, lower domestic final demand for goods produced by these occupations (contributing 2.7 percentage points of the decline) and the changing skill mix within industries away from the use of these occupations (contributing an equal 2.7 percentage points).

Thus, just as the declining employment share in industries most likely to displace workers was associated primarily with the domestic final demand factor, occupations most likely to displace workers were differentiated from others largely by that factor and the changing skill mix within industries, perhaps brought on by technological change, changes in the need for information and other changes in production processes.

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Appendix A: Tables

Table A-1

Percent Change in Employment Requirements by Major Factors and by Industries (Medium Aggregation), Canada, 1971-1981

	Employ. in 1971 (000's)	Total % Change in Employ.	Percentage Changes in Employment Requirements Related To: Change in Import 1	Change in Exports 2	Net Change in Trade	Change in Domestic Final Demand 3	Change in Labour Produc-tivity 4	Change in Technol. & Market Share
Agriculture	502.9	-0.2	-6.7	10.3	3.5	27.8	-16.1	-15.5
Forestry	59.9	1.2	-8.5	23.4	14.9	19.4	-19.3	-13.9
Fishing,Hunting & Trapping	20.2	79.3	-26.1	52.9	26.7	26.2	34.4	-8.0
Metal Mines	61.5	-2.9	-18.0	13.0	-5.0	49.2	-1.2	-45.9
Mineral Fuels	21.9	74.1	-12.7	12.8	0.2	104.6	50.8	-81.5
Non-Metal Mines & Quarries	20.1	4.2	-10.5	7.0	-3.4	27.1	-2.9	-16.6
Services Incidental to Mining	18.0	119.6	-9.9	6.5	-3.4	129.8	-44.9	38.1
Food & Beverage Industries	220.8	6.2	-6.3	7.5	1.2	18.8	-11.6	-2.3
Tobacco Products Industries	9.6	-9.4	-1.4	0.9	-0.5	19.8	-22.3	-6.4
Rubber & Plastic Prod. Ind.	44.9	36.8	-48.5	32.8	-15.7	65.2	-17.0	4.3
Leather Industries	28.0	-6.4	-29.1	3.4	-25.8	40.4	-19.3	-1.7
Textile Industries	69.6	-2.7	-29.5	18.4	-11.1	53.2	-18.3	-26.6
Knitting Mills	24.0	-14.4	-15.8	0.8	-15.0	40.4	-32.1	-7.6
Clothing Industries	99.5	-3.4	-15.6	1.1	-14.5	35.7	-23.0	-1.6
Wood Industries	93.0	21.6	-9.1	26.9	17.8	24.0	-14.1	-6.1
Furniture & Fixture Ind.	44.6	21.9	-18.6	10.9	-7.6	46.7	-10.0	-7.2
Paper & Allied Industries	119.1	9.0	-14.0	18.0	4.0	29.8	-14.7	-10.0
Printing &Publishing	85.8	26.0	-15.9	9.6	-6.3	55.6	-25.2	1.8
Primary Metal Industries	112.8	9.5	-42.0	28.7	-13.3	63.4	-5.4	-35.3
Metal Fabricating Industries	138.9	14.4	-36.4	20.4	-16.1	61.1	-9.1	-21.6
Machinery Industries	71.4	51.8	-121.3	59.1	-62.2	155.1	-18.7	-22.4
Transportation Equipment	150.6	18.4	-54.3	32.3	-22.1	71.9	-8.8	-22.7
Electrical Products Ind.	123.4	3.6	-68.6	27.3	-41.2	75.9	-37.8	6.7
Non-Metallic Mineral Prod.	51.9	6.4	-22.9	10.3	-12.6	43.7	-8.0	-16.7
Petroleum & Coal Products	14.1	52.6	-6.1	19.7	13.6	40.4	6.4	-7.7
Chemical & Chemical Prod.	77.5	14.3	-32.2	22.0	-10.2	55.7	-26.8	-4.4
Miscellaneous Manufacturing	57.9	15.2	-71.0	17.9	-53.1	93.0	-11.5	-13.2
Construction Industry	557.8	23.2	-1.0	1.0	0.0	31.5	-6.0	-2.3
Electric Power, Gas & Other	64.6	49.8	-10.1	16.0	5.9	59.7	-21.2	5.4
Transportation & Storage	376.6	24.5	-8.4	15.7	7.3	34.5	-15.2	-2.1
Communication	144.0	48.2	-11.2	8.2	-3.0	65.7	-35.8	21.3
Wholesale Trade	343.9	39.1	-13.0	13.1	0.1	49.2	-4.6	-5.5
Retail Trade	929.8	46.4	-2.6	2.3	-0.4	45.4	5.2	-3.8
Other Fin., Ins. & Real Est.	336.2	64.5	-11.1	6.7	-4.4	66.6	-11.0	13.2
Serv. to Business Man.	267.8	113.2	-43.8	26.8	-17.0	94.1	-16.3	52.4
Education & Health Serv.	77.3	52.3	-1.2	2.4	1.2	53.0	-2.1	0.1
Amusement & Recreation S.	45.3	85.4	-3.6	1.9	-1.7	88.0	-1.9	1.0
Accommodation & Food Serv.	297.9	72.5	-3.4	2.1	-1.3	60.3	12.8	0.6
Other Personal & Misc. Serv.	158.6	82.6	-3.4	2.6	-0.8	41.9	37.8	3.8
Total	5941.6	35.3	-15.6	11.4	-4.2	49.8	-7.7	-2.6

1 Estimated using job-output ratios (labour productivity) of Canadian industries.

2 Includes some increase in the demand for imports as intermediate inputs in the production of exports as well as the demand for domestically-produced goods and services as intermediate inputs.

3 Includes increase in domestic demand for imports as well as domestically-produced goods and services

4 As indicated by change in the job-output ratios.

Source Statistics Canada, Input-Output Division, Special Tabulations.

Table A-2

Percent Change in Employment Requirements by Major Factors and by Industries, With Import Leakages Excluded (Medium Aggregation), Canada, 1971-1981

	1971 Employ-ment (000's)	Total % Change in Employ.	Percent Changes in Employment Related to: Change in Exports 1	Change in Domestic Final Demand 2	Change in Labour Produc-tivity 3	Change in Technol. & Market Share Mat.
Agriculture	502.9	-0.2	9.3	22.0	-16.1	-15.5
Forestry	59.9	1.2	21.2	13.2	-19.3	-13.9
Fishing,Hunting & Trapping	20.2	79.3	50.4	2.5	34.4	-8.0
Metal Mines	61.5	-2.9	6.6	37.6	-1.2	-45.9
Mineral Fuels	21.9	74.1	2.5	102.3	50.8	-81.5
Non-Metal Mines & Quarries	20.1	4.2	4.6	19.0	-2.9	-16.6
Services Incidental to Mining	18.0	119.6	3.1	123.3	-44.9	38.1
Food & Beverage Industries	220.8	6.2	6.8	13.2	-11.6	-2.3
Tobacco Products Industries	9.6	-9.4	0.9	18.4	-22.3	-6.4
Rubber & Plastic Products	44.9	36.8	23.3	26.3	-17.0	4.3
Leather Industries	28.0	-6.4	2.0	12.5	-19.3	-1.7
Textile Industries	69.6	-2.7	14.0	28.1	-18.3	-26.6
Knitting Mills	24.0	-14.4	-0.1	25.4	-32.1	-7.6
Clothing Industries	99.5	-3.4	0.9	20.3	-23.0	-1.6
Wood Industries	93.0	21.6	24.6	17.2	-14.1	-6.1
Furniture & Fixture Ind.	44.6	21.9	10.4	28.7	-10.0	-7.2
Paper & Allied Industries	119.1	9.0	15.0	18.8	-14.7	-10.0
Printing &Publishing	85.8	26.0	6.9	42.5	-25.2	1.8
Primary Metal Industries	112.8	9.5	18.1	32.1	-5.4	-35.3
Metal Fabricating Industries	138.9	14.4	13.8	31.3	-9.1	-21.6
Machinery Industries	71.4	51.8	40.5	52.4	-18.7	-22.4
Transportation Equipment	150.6	18.4	25.0	24.9	-8.8	-22.7
Electrical Products Ind.	123.4	3.6	19.5	15.2	-37.8	6.7
Non-Metallic Mineral Prod.	51.9	6.4	6.3	24.9	-8.0	-16.7
Petroleum & Coal Products	14.1	52.6	17.9	36.0	6.4	-7.7
Chemical & Chemical Prod.	77.5	14.3	15.2	30.3	-26.8	-4.4
Miscellaneous Manufacturing	57.9	15.2	9.3	30.6	-11.5	-13.2
Construction Industry	557.8	23.2	0.8	30.7	-6.0	-2.3
Electric Power, Gas & Other	64.6	49.8	13.9	51.8	-21.2	5.4
Transportation & Storage	376.6	24.5	14.1	27.7	-15.2	-2.1
Communication	144.0	48.2	6.4	56.2	-35.8	21.3
Wholesale Trade	343.9	39.1	10.9	38.4	-4.6	-5.5
Retail Trade	929.8	46.4	1.8	43.2	5.2	-3.8
Other Finance, Ins. & Real E.	336.2	64.5	5.1	57.2	-11.0	13.2
Serv. to Business Man.	267.8	113.2	19.6	57.4	-16.3	52.4
Education & Health Serv.	77.3	52.3	2.4	51.9	-2.1	0.1
Amusement & Recreation S.	45.3	85.4	1.5	84.8	-1.9	1.0
Accommodation & Food Serv.	297.9	72.5	1.5	57.5	12.8	0.6
Other Personal & Misc. S.	158.6	82.6	2.0	39.1	37.8	3.8
Total	5941.6	35.3	8.8	36.8	-7.7	-2.5

1 Excludes imports used as intermediate inputs in the production of exports. Hence it indicates change in employment requirements due to exports for domestic industries only.

2 Excludes that portion of domestic final demand met by imports. Hence, it indicates the changes in employment requirements in domestic industries due to changes in domestic final demand.

3 As indicated by change in the job-output ratios.

Source Statistics Canada, Input-Output Division, Special Tabulations.

Table A-3

Percent Change in Employment Requirements of Fastest Growing and Declining Manufacturing Industries (Large Aggregation), Canada, 1971-1981

Declining (39)	Employ. in 1971 (000's)	Total % Change in Employ.	Percentage Changes in Employment Requirements Due To: Change in Imports 1	Change in Exports 2	Net Change in Trade	Change in Domestic Demand 3	Change in Labour Produc-tivity 4	Change in Technol. & Market Share
Distilleries	5,657	-2.7	-12.7	8.5	-4.2	18.0	-7.3	-9.1
Misc. Mfg. Ind. NES.	12,653	-2.7	-54.8	21.9	-32.9	69.7	-15.8	-23.7
Clothing	99,524	-3.4	-15.6	1.1	-14.5	35.7	-23.0	-1.6
Confectionery Mfg.	9,964	-4.0	-1.1	0.2	-0.9	6.5	-11.1	1.4
Small Electrical Appliances	5,600	-4.1	-64.5	4.7	-59.8	87.9	-18.7	-13.4
Tobacco Products	8,176	-5.6	-1.7	0.8	-0.9	18.9	-22.4	-1.2
Fruit & Vegetable Proc.	18,173	-6.1	-14.0	9.2	-4.8	24.5	-17.7	-8.0
Shoe Facturies	17,627	-6.5	-26.5	1.9	-24.6	34.6	-22.3	5.8
Biscuit Mfg.	6,875	-7.3	1.4	3.0	4.4	-9.0	-5.1	2.4
Soft Drink Mfg.	14,398	-8.2	-2.7	1.4	-1.3	2.4	-15.1	5.8
Veneer & Plywood Mills	12,567	-10.7	-3.7	7.3	3.6	22.3	-8.4	-28.1
Other Knitting Mills	17,205	-10.9	-19.8	1.0	-18.8	45.0	-29.4	-7.7
Clay Products	4,721	-11.2	-49.1	8.8	-40.3	66.3	-6.2	-31.2
Thread Mills	958	-11.6	-57.4	9.4	-48.0	72.5	-14.7	-21.4
Bakeries	30,537	-11.7	-2.2	0.5	-1.7	3.6	-0.5	-13.1
Narrow Fabric Mills	2,219	-11.7	-19.5	7.4	-12.1	59.9	0.6	-60.2
Dairy Factories	29,950	-12.5	-1.2	-0.1	-1.3	15.3	-20.3	-6.2
Sugar Refineries	2,866	-14.5	-5.2	9.5	4.3	-0.1	-20.0	1.3
Copper & Alloy Rolling	3,572	-15.3	-40.5	17.4	-23.1	52.6	-21.5	-23.3
Iron Foundries	9,862	-15.5	-28.4	22.4	-6.0	52.9	-4.3	-58.2
Concrete Products	10,862	-15.6	-1.3	-1.4	-2.7	22.5	-4.7	-30.7
Paint & Varnish	8,673	-17.8	-18.3	8.8	-9.5	33.9	-23.5	-18.6
Leather Tanneries	2,887	-20.7	-28.9	12.5	-16.4	49.3	-7.0	-46.6
Cotton Yarn & Cloth Mills	12,554	-20.9	-22.4	8.2	-14.2	51.0	-19.6	-38.1
Synthetic Textile Mills	20,198	-21.9	-29.3	18.9	-10.4	46.1	-31.6	-25.9
Broom, Brush & Mop	2,339	-22.2	-26.1	4.1	-22.0	34.3	-11.0	-23.4
Hosiery Mills	6,747	-23.3	-5.7	0.3	-5.4	28.4	-39.0	-7.3
Mixed Fertilizers	1,334	-23.4	-4.6	25.4	20.8	16.6	-13.6	-47.2
Cotton & Jute Bag	918	-25.2	-29.1	7.1	-22.0	28.5	-13.7	-18.0
Linoleum & Coted Fabrics	3,916	-27.0	-44.4	16.0	-28.4	50.4	-18.7	-30.2
Wool, Yarn & Cloth Mills	6,492	-27.8	-20.8	12.4	-8.4	31.3	-17.5	-33.1
Leaf Tobacco Processing	1,406	-31.3	-0.1	1.5	1.4	25.1	-21.7	-36.1
Misc. Transp. Equipment	8,771	-33.8	-11.2	-32.9	-44.1	-1.2	13.2	-1.7
Rubber Footwear	3,104	-34.6	-8.9	-2.0	-10.9	25.2	-15.0	-33.9
Leather Glove	1,464	-35.5	-3.1	-1.1	-4.2	1.2	-6.1	-26.2
Cordage & Twine	837	-35.5	1.2	15.3	16.5	28.7	0.1	-80.8
Coffin & Casket	1,236	-40.2	-10.8	3.9	-6.9	11.9	-20.4	-24.8
Radio & Television Receivers	7,751	-57.1	-94.5	12.8	-81.7	82.2	-70.9	13.2
Fibre Preparing Mills	714	-65.1	2.7	16.0	18.7	46.1	-2.0	-127.9
Total (Declining)	415,307	-12.0	-17.2	4.4	-12.8	31.1	-18.2	-12.0

Table A-3 (Cont'd)

Percent Change in Employment Requirements of Fastest Growing and Declining Manufacturing Industries (Large Aggregation), Canada, 1971-1981

Fastest Growing (30)	Employ. in 1971 (000's)	Total % Change in Employ.	Percentage Changes in Employment Requirements Due To: Change in Imports 1	Change in Exports 2	Net Change in Trade	Change in Domestic Demand 3	Change in Labour Produc-tivity 4	Change in Technol. & Market Share
Misc. Food Ind.	18,634	26.8	-9.8	5.9	-3.9	38.3	-10.7	3.1
Breweries	9,861	28.0	-2.8	9.1	6.3	29.5	-5.4	-2.5
Hardware Tool & Cutlery	15,028	30.6	-99.2	29.2	-70.0	130.9	-2.2	-28.1
Soap & Cleaning Compound	5,872	31.6	-11.8	7.5	-4.3	59.1	-21.4	-1.8
Ornamental & Arch. Metal	13,441	31.6	-6.8	9.8	3.0	40.0	-17.4	6.0
Toilet Preparations	5,472	33.1	-14.6	4.9	-9.7	56.6	-16.6	2.9
Poultry Processors	7,520	33.9	-4.5	0.9	-3.6	33.0	-1.7	6.2
Engraving & Stereotyping	6,772	34.3	-12.3	13.3	1.0	63.9	-17.0	-13.6
Metal Casting	3,833	35.3	-87.2	49.9	-37.3	105.3	-0.1	-32.6
Stone Products	1,071	35.6	-22.9	13.1	-9.8	56.3	-4.3	-6.6
Tire & Tube	11,714	36.4	-43.2	47.9	4.7	59.4	-6.4	-21.3
Wineries	1,001	36.7	-164.8	1.3	-163.5	206.2	5.0	-11.0
Steel Pipe & Tube Mills	5,252	37.1	-34.3	47.9	13.6	78.6	-7.1	-48.0
Boiler & Plate Works	7,857	42.5	-19.5	13.8	-5.7	58.6	8.0	-18.4
Scientific & Professional	17,862	42.8	-144.3	34.9	-109.4	154.2	1.7	-3.6
Misc. Machinery & Equip.	50,476	42.9	-72.0	45.6	-26.4	118.8	-4.7	-44.8
Line Manufacturers	671	44.7	-28.5	29.7	1.2	70.8	-6.4	-20.9
Fish Products	18,635	46.9	-17.9	40.6	22.7	23.2	8.2	-7.2
Plastic & Synthetic Res.	4,366	48.9	-81.7	55.0	-26.7	91.0	-44.2	28.8
Misc. Textile	13,662	51.2	-52.2	41.2	-11.0	83.9	-4.9	-16.8
Sash & Door & Planing	16,970	52.3	-8.1	11.9	3.8	47.2	-4.6	6.0
Petroleum Refineries	13,530	54.4	-4.7	19.2	14.5	38.8	6.4	-5.3
Plastic Manufacturers, NES.	21,156	54.9	-63.7	32.2	-31.5	76.5	-27.5	37.5
Railroad Rolling Stock	6,346	63.6	-29.7	36.3	6.6	82.7	17.5	-43.2
Aircraft & Parts	23,785	63.6	-115.2	70.7	-44.5	150.2	-21.9	-20.1
Office Furniture	4,717	71.3	-9.3	40.5	31.2	49.7	-25.1	15.5
Agricultural Implement	8,930	79.3	-196.1	65.2	-130.9	227.9	-28.7	10.9
Office & Store Machinery	8,682	86.0	-328.8	140.8	-188.0	306.9	-83.4	50.6
Pressed & Punched Felt	404	91.8	-61.1	22.3	-38.8	89.4	-19.1	60.4
Vegetable Oil Mills	757	103.2	-28.4	47.4	19.0	72.1	-29.6	41.6
Total (Fastest Growing)	324,277	46.4	-62.4	36.0	-26.4	92.3	-10.3	-9.2
Total (All industries)	5,942	35.3	-15.6	11.4	-4.2	49.8	-7.7	-2.6

1 Estimated using job-output ratios (labour productivity) of Canadian industries.

2 Includes some increase in the demand for imports as intermediate inputs in the production of exports as well as the demand for domestically-produced goods and services as intermediate inputs.

3 Includes increase in domestic demand for imports as well as domestically-produced goods and services

4 As indicated by change in the job-output ratios.

Source Statistics Canada, Input-Output Division, Special Tabulations.

Table A-4

Change in Share of Employment Requirements by Major Factors and by Industry (Medium Aggregation), Canada, 1971-1981

	1971 Employ-ment (000's)	Total Change in Share	Change in Share due to : Net Change in Trade	Change in Domestic Final Demand	Change in Labour Produc-tivity	Change in Technol. & Market Share
Agriculture	502.9	-2.22	0.48	-1.38	-0.53	-0.80
Forestry	59.9	-0.25	0.14	-0.23	-0.09	-0.08
Fishing,Hunting & Trapping	20.2	0.11	0.08	-0.06	0.11	-0.01
Metal Mines	61.5	-0.29	-0.01	0.00	0.05	-0.33
Mineral Fuels	21.9	0.11	0.01	0.15	0.16	-0.22
Non-Metal Mines & Quarries	20.1	-0.08	0.00	-0.06	0.01	-0.03
Services Incidental to Mining	18.0	0.19	0.00	0.18	-0.08	0.09
Food & Beverage Industries	220.8	-0.80	0.15	-0.85	-0.11	0.01
Tobacco Products Industries	9.6	-0.05	0.00	-0.04	-0.02	0.00
Rubber & Plastic Products	44.9	0.01	-0.06	0.09	-0.05	0.04
Leather Industries	28.0	-0.15	-0.08	-0.03	-0.04	0.00
Textile Industries	69.6	-0.33	-0.06	0.03	-0.09	-0.21
Knitting Mills	24.0	-0.15	-0.03	-0.03	-0.07	-0.01
Clothing Industries	99.5	-0.48	-0.13	-0.17	-0.19	0.01
Wood Industries	93.0	-0.16	0.25	-0.30	-0.07	-0.04
Furniture & Fixture Ind.	44.6	-0.07	-0.02	-0.02	-0.01	-0.03
Paper & Allied Industries	119.1	-0.39	0.12	-0.30	-0.10	-0.11
Printing &Publishing	85.8	-0.10	-0.02	0.06	-0.19	0.05
Primary Metal Industries	112.8	-0.36	-0.13	0.19	0.03	-0.46
Metal Fabricating Industries	138.9	-0.36	-0.21	0.20	-0.02	-0.33
Machinery Industries	71.4	0.15	-0.51	0.93	-0.10	-0.18
Transportation Equipment	150.6	-0.32	-0.33	0.41	-0.02	-0.37
Electrical Products Ind.	123.4	-0.49	-0.57	0.40	-0.46	0.14
Non-Metallic Mineral Prod.	51.9	-0.19	-0.05	-0.04	0.00	-0.09
Petroleum & Coal Products	14.1	0.03	0.03	-0.02	0.02	-0.01
Chemical & Chemical Prod.	77.5	-0.20	-0.06	0.06	-0.18	-0.02
Miscellaneous Manufacturing	57.9	-0.15	-0.35	0.31	-0.03	-0.08
Construction Industry	557.8	-0.84	0.29	-1.27	0.12	0.02
Electric Power, Gas & Other	64.6	0.12	0.08	0.08	-0.11	0.06
Transportation & Storage	376.6	-0.51	0.54	-0.72	-0.35	0.02
Communication	144.0	0.23	0.02	0.28	-0.50	0.43
Wholesale Trade	343.9	0.16	0.18	-0.03	0.13	-0.12
Retail Trade	929.8	1.28	0.44	-0.51	1.49	-0.14
Other Finance, Ins. & Real E.	336.2	1.22	-0.01	0.70	-0.14	0.66
Serv. to Business Man.	267.8	2.59	-0.43	1.48	-0.29	1.83
Education & Health Serv.	77.3	0.16	0.05	0.03	0.05	0.03
Amusement & Recreation S.	45.3	0.28	0.01	0.22	0.03	0.02
Accommodation & Food Serv.	297.9	1.38	0.11	0.39	0.76	0.12
Other Personal & Misc. S.	158.6	0.93	0.07	-0.16	0.90	0.13
Total	5941.6	0.00	0.00	0.00	0.00	0.00

Source Statistics Canada, Input-Output Division Special Tabulations.

Table A-5

Percent Change in Employment Requirements by Factors and 22 Major Occupations, Canada, 1971-1981

	1971 Employ-ment (000's)	Total % Change in Employ-ment	Percent Change in Employment Requirements Due to: Net Trade	Domestic Final Demand 1	Labour Produc-tivity 2	Technol. & Market Share	Skill Mix
Managerial/ Admin.	252.0	117.2	-10.5	88.0	-16.8	4.9	51.6
Natural Sciences	164.3	65.9	-13.2	76.7	-16.4	4.9	14.0
Social Sciences	27.0	114.9	-12.8	91.6	-13.7	34.6	15.3
Religion	0.5	0.6	-1.0	34.4	-3.1	1.3	-31.2
Teaching	30.0	61.1	-1.0	58.7	-4.5	3.1	4.8
Medecine/ Health	43.5	73.3	-4.5	63.4	-4.4	-2.8	21.7
Art/ Literary	57.1	92.5	-9.4	84.0	-16.1	15.4	19.7
Clerical	989.9	50.6	-5.1	58.3	-9.6	3.4	3.6
Sales	808.0	31.6	-1.9	44.8	-0.7	-1.5	-9.2
Services	568.8	58.7	-2.2	52.4	11.1	3.7	-6.3
Farming	516.9	-2.9	3.2	27.3	-14.6	-14.0	-4.7
Fishing	21.9	67.7	20.6	26.1	23.0	-6.8	4.7
Forestry	49.0	-4.3	12.4	19.9	-16.4	-11.3	-8.9
Mining	52.4	9.1	-3.4	53.7	-4.0	-23.1	-14.0
Processing	317.3	20.5	-3.7	42.3	-12.6	-11.9	6.4
Machining	228.5	12.7	-15.8	60.3	-10.5	-12.7	-8.6
Prod. Fabrication	610.6	30.1	-12.7	56.5	-12.1	-7.3	5.7
Construction	528.1	19.6	-0.8	35.8	-8.2	-2.2	-4.9
Transport. Equipment	288.2	24.5	3.3	38.0	-11.3	-2.9	-2.6
Material Handling	183.1	4.8	-2.8	37.6	-9.0	-6.1	-15.0
Other Crafts	81.1	25.7	-5.0	53.2	-18.3	0.6	-4.8
Not Classified	123.3	-10.3	-4.4	35.4	-5.6	-3.0	-32.7
Total	5,941.4	35.3	-4.2	49.8	-7.7	-2.6	0.0

1 Includes increase in domestic demand for imports as well as domestically-produced goods and services.

2 As indicated by change in the job-output ratios.

Source Statistics Canada, Input-Output Division, Special Tabulations, and 1971 and 1981 Censuses.

Table A-6

Percent Change in Employment Requirements by Factors and Detailed Occupations, Canada, 1971-1981

	1971 Employ-ment (000's)	Total % Change in Employ-ment	Percent Change in Employment Requirements due to: Net Change in Trade	Change in Domestic Final Demand	Change in Labour Produc-tivity	Change in Technol. & Market Share	Change in Skill Mix
Management/ Admin.	101.7	260.5	-16.6	143.7	-27.1	2.0	158.6
Management Support	144.4	21.2	-6.5	50.6	-9.2	6.5	-20.2
Physical Sciences	21.4	12.2	-6.6	52.5	-9.1	-5.6	-19.0
Life Sciences	5.4	88.5	8.1	54.7	-18.5	-4.9	49.2
Architecture/ Engineer.	65.7	60.5	-14.3	76.2	-16.6	5.2	10.0
Other Arch/ Eng.	53.7	64.2	-15.3	77.3	-16.9	6.6	12.6
Mathemat/ Statistics	18.1	147.4	-17.4	111.9	-22.5	13.9	61.6
Social Work	4.5	119.2	-11.4	92.9	-18.0	15.4	40.4
Social Sciences	4.9	156.6	-9.3	104.2	-7.7	28.1	41.3
Law/ Jurisprudence	15.5	96.7	-15.0	86.5	-14.7	44.6	-4.7
Library/Arch.	1.7	138.8	-7.8	96.6	-13.7	16.4	47.3
Health Diagnosing	4.4	82.3	2.4	59.5	-14.0	-10.6	45.0
Nursing	21.5	61.9	-0.3	57.1	-3.3	1.0	7.5
Other Health	17.6	85.1	-11.4	72.0	-3.3	-5.4	33.2
Fine Arts	25.7	76.9	-12.8	74.8	-13.2	16.5	11.5
Performing Arts	11.8	116.3	-4.1	97.7	-21.1	14.2	29.6
Writing	12.7	91.8	-10.9	84.6	-27.9	19.4	26.6
Sports/ Recreation	6.9	119.9	-3.0	93.4	3.2	5.9	20.5
Steno/ Typing	204.4	31.5	-6.1	53.5	-9.6	6.9	-13.2
Bookkeeping	306.4	94.3	-4.6	71.4	-6.8	2.8	31.6
EDP Operator	38.3	72.9	-8.9	72.5	-14.3	5.7	17.8
Material Record	136.8	44.8	-8.3	58.0	-9.4	-6.7	11.1
Library Clerk	13.1	27.2	-4.3	51.1	-9.0	5.4	-16.1
Reception	110.9	41.0	-4.2	57.9	-19.1	11.5	-5.1
Other Clerical	179.9	5.0	-2.3	39.6	-7.7	2.4	-27.0
Commodities Sales	682.0	30.4	-1.7	43.3	0.8	-3.4	-8.5
Service Sales	91.8	55.1	-4.3	62.7	-11.2	12.6	-4.8
Other Sales	34.2	-9.0	-0.6	26.9	-1.8	-0.2	-33.3
Protection Services	33.8	39.8	-6.8	56.8	-8.8	14.5	-15.9
Food Preparation	210.7	75.1	-1.3	61.5	10.9	0.9	3.2
Lodging/ Accommodation	49.5	28.7	-1.2	45.9	6.6	1.8	-24.3
Personnal Services	115.5	67.7	-0.6	40.4	30.5	3.5	-6.1
Apparel/ Furnishing	28.4	55.9	-2.4	39.3	24.7	2.6	-8.8
Other Services	130.8	41.1	-4.2	52.7	-2.1	6.7	-12.0

Table A-6 (Cont'd)

Percent Change in Employment Requirements by Factors and Detailed Occupations, Canada, 1971-1981

	1971 Employ-ment (000's)	Total % Change in Employ-ment	Percent Change in Employment Requirements due to: Net Change in Trade	Change in Domestic Final Demand	Change in Labour Produc-tivity	Change in Technol. & Market Share	Change in Skill Mix
Farmers	250.2	-0.9	3.5	27.6	-16.0	-15.4	-0.7
Farm Management	20.7	80.8	6.4	50.4	-29.2	-28.0	81.2
Other Farming	246.0	-11.9	2.5	25.0	-12.0	-11.4	-16.1
Fishing/ Trapping	21.9	67.7	20.6	26.1	23.0	-6.8	4.7
Forest/ Logging	49.0	-4.3	12.4	19.9	-16.4	-11.3	-8.9
Mining/ Quarrying	52.4	9.1	-3.4	53.7	-4.0	-23.1	-14.0
Mineral Ore	6.5	14.8	-10.2	60.3	-4.8	-37.8	7.3
Metal Process	42.3	51.1	-22.3	87.0	-11.8	-34.8	32.8
Clay/Stone Process	16.0	-5.7	-9.6	37.8	-6.8	-12.4	-14.8
Chemical Process	30.2	26.9	-9.5	58.7	-18.1	-7.4	3.2
Food Process	112.3	21.9	0.9	27.0	-8.4	-2.9	5.3
Wood Process	33.7	16.8	15.2	24.8	-13.3	-6.1	-3.8
Pulp/Paper	32.2	26.7	4.7	34.9	-16.9	-11.4	15.4
Textile Process	36.7	-5.9	-11.9	48.3	-20.2	-19.2	-2.9
Other Processing	7.5	-16.5	-9.3	29.4	-16.7	-4.9	-15.0
Metal Machining	84.0	-3.7	-17.0	57.3	-9.7	-13.5	-20.8
Metal Shaping	112.1	27.1	-17.0	66.7	-11.3	-13.0	1.7
Wood Machining	13.9	-17.9	3.5	24.5	-8.3	-4.9	-32.7
Clay/ Stone Machining	5.6	50.4	-21.9	69.9	-10.1	-16.0	28.4
Other Machining	12.9	11.3	-15.8	59.3	-10.9	-12.6	-8.7
Metal Fabricating	52.0	53.3	-30.4	96.0	-12.9	-24.2	24.8
Electronic Fabricating	79.0	38.5	-27.5	76.4	-25.2	0.5	14.2
Wood Fabricating	20.1	76.2	-0.9	58.8	-14.9	-9.2	42.5
Textile Frabricating	143.3	10.5	-14.1	42.7	-16.3	-4.8	3.0
Plastic Frabricating	21.6	49.0	-17.1	70.4	-16.3	-0.3	12.3
Mechan./ Repair	235.0	31.9	-2.9	47.8	-4.8	-7.4	-0.8
Other Prod. Fabricating	59.7	16.5	-15.7	57.1	-9.9	-10.4	-4.7
Excavating/ Paving	73.6	18.6	1.8	33.1	-8.3	-3.5	-4.4
Electrical Instal.	90.4	26.6	-2.9	47.0	-16.0	2.1	-3.7
Other Construction	364.1	18.0	-0.8	33.5	-6.3	-3.1	-5.3
Air Transportation	7.0	98.1	9.9	57.7	-22.6	-5.0	58.2
Railway Transportation	27.8	0.6	5.2	29.0	-11.9	-2.9	-18.8
Water Transportation	13.8	-8.5	4.5	26.2	-9.7	-2.0	-27.6
Motor Transportation	235.0	27.9	2.8	39.4	-11.1	-2.8	-0.5
Other Transportation	4.6	-19.2	1.1	28.3	-7.3	-8.2	-33.0
Material Handling	183.1	4.8	-2.8	37.6	-9.0	-6.1	-15.0
Printing	40.5	33.3	-7.3	58.4	-23.8	1.0	5.0
Stationary Engineer	30.9	9.1	-0.9	42.3	-10.6	-5.5	-16.3
Electronic Equipment	5.6	29.0	-4.0	57.6	-22.0	12.0	-14.5
Other Crafts	4.0	72.3	-14.2	77.6	-15.7	26.6	-2.0
Persons Not Classified	123.3	-10.3	-4.4	35.4	-5.6	-3.0	-32.7
Total	5941.5	35.3	-4.2	49.8	7.7	-2.6	0.0

Source Statistics Canada, Input-Output Division, Special Tabulations, and 1971 and 1981 Censuses.

Table A-7

Percent Change in Employment Requirements by Major Factors for the 20 Fastest Growing and 20 Declining Occupations, Canada, 1971-1981

			Percent Change in Employment Requirements due to:				
Fastest Growing	1971 Employ-ment (000's)	Total % Change in Employ-ment	Net Change in Trade	Change in Domestic Final Demand	Change in Labour Produc-tivity	Change in Technol. & Market Share	Change in Skill Mix
Management/ Admin.	101.7	260.6	-16.6	143.7	-27.1	2.0	158.6
Social Work	4.9	156.6	-9.3	104.2	-7.7	28.1	41.3
Mathemat./ Stat.	18.1	147.4	-17.4	111.9	-22.5	13.9	61.6
Library/ Arch.	1.7	138.8	-7.8	96.6	-13.7	16.4	47.3
Sports/ Recreation	6.9	119.9	-3.0	93.4	3.2	5.8	20.5
Social Sciences	4.5	119.2	-11.4	92.9	-18.0	15.4	40.4
Performing Arts	11.8	116.3	-4.1	97.7	-21.1	14.2	29.6
Air Transp. Occup.	7.0	98.1	9.9	57.7	-22.6	-5.0	58.2
Law/ Jurisp.	15.5	96.7	-15.0	86.5	-14.7	44.6	-4.7
Bookkeeping	306.4	94.3	-4.6	71.4	-6.8	2.8	31.6
Writing	12.7	91.8	-10.9	84.6	-27.9	19.4	26.6
Life Science	5.4	88.5	8.1	54.7	-18.5	-4.9	49.2
Other Health	17.6	85.1	-11.4	72.0	-3.3	-5.4	33.2
Health	4.4	82.3	2.4	59.5	-14.0	-10.6	45.0
Farm Management	20.7	80.8	6.4	50.4	-29.2	-28.0	81.2
Fine Arts	25.7	76.9	-12.8	74.8	-13.2	16.5	11.5
Wood Fabrication	20.1	76.2	-0.9	58.8	-14.9	-9.2	42.5
Food Preparation	210.7	75.1	-1.3	61.5	10.9	0.9	3.2
EDP Oerator	38.3	72.9	-8.9	72.5	-14.3	5.7	17.8
Other Craft	4.0	72.3	-14.2	77.6	-15.7	26.6	-2.0
Total	838.1	109.3	-5.9	79.0	-7.3	3.2	40.3
Slowest Growing							
Physical Science	21.4	12.2	-6.6	52.5	-9.1	-5.6	-19.0
Other Machining	12.9	11.3	-15.8	59.3	-10.9	-12.6	-8.7
Textile Fabrication	143.3	10.5	-14.1	42.7	-16.3	-4.8	3.0
Mining/ Quarry	52.4	9.1	-3.4	53.7	-4.0	-23.1	-14.0
Stationary Eng.	30.9	9.1	-0.9	42.3	-10.6	-5.5	-16.3
Other Clerical	179.9	5.0	-2.3	39.6	-7.7	2.4	-27.0
Material Handling	183.1	4.8	-2.8	37.6	-9.0	-6.1	-15.0
Railway Transp.	27.8	0.6	5.2	29.0	-11.9	-2.9	-18.8
Farmers	250.2	-0.9	3.5	27.6	-16.0	-15.4	-0.7
Metal Machining	84.0	-3.7	-17.0	57.3	-9.7	-13.5	-20.8
Forestry/ Logging	49.0	-4.3	12.4	19.9	-16.4	-11.3	-8.9
Clay/ Stone Proc.	16.0	-5.7	-9.6	37.8	-6.8	-12.4	-14.8
Textile Processing	36.7	-5.9	-11.9	48.3	-20.2	-19.2	-2.9
Water Transp.	13.8	-8.5	4.5	26.2	-9.7	-2.0	-27.6
Other Sales	34.2	9.0	-0.6	26.9	-1.8	-0.2	-33.3
Not Classified	123.3	-10.3	-4.4	35.4	-5.6	-3.0	-32.7
Other Farming	246.0	-11.9	2.5	25.0	-12.0	-11.4	-16.1
Other Processing	7.5	-16.5	-9.3	29.4	-16.7	-4.9	-15.0
Wood Machining	13.9	-17.9	3.5	24.5	-8.3	-4.9	-32.7
Other Transp.	4.6	-19.2	1.1	28.3	-7.3	-8.2	-33.0
Total	1530.8	-1.1	-2.5	35.6	-11.2	-8.4	-14.6

Source Statistics Canada, Input-Output Division and 1971 & 1981 Censuses.

Table A-8

Change in Share of Employment Requirements by Major Factors and for 22 Occupational Groups, Canada, 1971-1981

	1971 Employ-ment (000's)	Total Change in Share	Change in Share due to: Net Trade	Domestic Final Demand 1	Labour Produc-tivity 2	Technol. & Market Share	Skill Mix
Managerial/ Admin.	252	2.56	-0.20	1.20	-0.29	0.24	1.62
Natural Sciences	164.3	0.63	-0.18	0.55	-0.18	0.15	0.29
Social Sciences	27.0	0.27	-0.03	0.14	-0.02	0.13	0.05
Religion	0.5	0.00	0.00	0.00	0.00	0.00	0.00
Teaching	30.0	0.10	0.01	0.03	0.01	0.02	0.02
Medecine/ Health	43.5	0.21	0.00	0.07	0.02	0.00	0.12
Art/ Literary	57.1	0.41	-0.04	0.24	-0.06	0.13	0.14
Clerical	989.9	1.88	-0.12	1.05	-0.24	0.74	0.44
Sales	808.0	-0.38	0.22	-0.50	0.70	0.12	-0.92
Services	568.8	1.65	0.14	0.19	1.32	0.45	-0.45
Farming	516.9	-2.45	0.47	-1.45	-0.45	-0.73	-0.30
Fishing	21.9	0.09	0.07	-0.06	0.08	-0.01	0.01
Forestry	49.0	-0.24	0.10	-0.18	-0.05	-0.05	-0.05
Mining	52.4	-0.17	0.01	0.03	0.02	-0.13	-0.09
Processing	317.3	-0.58	0.02	-0.30	-0.19	-0.37	0.25
Machining	228.5	-0.64	-0.33	0.30	-0.08	-0.29	-0.24
Prod. Fabrication	610.6	-0.40	-0.65	0.51	-0.33	-0.35	0.43
Construction	528.1	-1.03	0.22	-0.92	-0.04	0.03	-0.32
Transport. Equipment	288.2	-0.39	0.27	-0.42	-0.13	-0.01	-0.09
Material Handling	183.1	-0.70	0.03	-0.28	-0.03	-0.08	-0.34
Other Crafts	81.1	-0.10	-0.01	0.03	-0.11	0.03	-0.05
Not Classified	123.3	-0.70	0.00	-0.22	0.03	-0.01	-0.50
Total	5941.4	0.00	0.00	0.00	0.00	0.00	0.00

1 Includes increase in domestic demand for imports as well as domestically-produced goods and services.

2 As indicated by change in the job-output ratios.

Source Statistics Canada, Input-Output Division, Special Tabulations and 1971 and 1981 Censuses.

Table A-9

Proportion of Output Serving as Intermediate Input to Other Industries, by Major Sectors, Canada, 1971-1981

Above Average	%	Below Average	%
Agriculture	62	Non-Metal Mines & Quarries	35
Forestry	94	Food & Beverage Industries	34
Fishing, Hunting & Trapping	73	Tobacco Products Industries	15
Metal Mines	50	Leather Industries	20
Mineral Fuels	68	Knitting Mills	32
Services Incidental to Mining	99	Clothing Industries	8
Rubber & Plastic Products Ind.	58	Furniture & Fixture Industries	10
Textile Industries	55	Machinery Industries	22
Wood Industries	47	Transportation Equipment Ind.	13
Paper and Allied Industries	45	Electrical Products Industries	34
Printing & Publishing	75	Misc. Manufacturing Ind.	32
Primary Metal Industries	57	Construction Industry	14
Metal Fabricating Industries	70	Retail Trade	15
Non-Metallic Mineral Product	82	Other Finance, Ins. & Real Estate	41
Petroleum & Coal Products Ind.	57	Education & Health Services	0
Chemical & Chemical Products	54	Amusement & Recreation Services	19
Transportation & Storage	72	Accommodation & Food Services	17
Communications	55	Other Personal & Misc. Services	17
Electric Power, Gas & Other	42		
Wholesale Trade	44		
Service to Business Man.	69		

Source Statistics Canada, Input-Output Division.

Table A-10

Import and Export Share of Commodities Produced Canadian Industries, Canada, 1971 and 1981

	Import Share		Export Share	
	1971	1981	1971	1981
Agriculture	9.3	12.3	23.2	25.0
Forestry	2.6	2.6	3.5	2.8
Fishing,Hunting & Trapping	15.6	16.6	20.2	24.1
Metal Mines	17.1	29.4	44.6	53.3
Mineral Fuels	47.3	31.3	49.4	23.8
Non-Metal Mines & Quarries	23.4	21.1	39.7	31.3
Services Incidental to Mining	1.8	1.5	0.5	0.6
Food & Beverage Industries	8.7	10.7	9.8	12.0
Tobacco Products Industries	3.0	3.1	10.0	9.4
Rubber & Plastic Products Ind.	30.7	28.0	11.1	12.1
Leather Industries	27.0	37.8	4.7	6.9
Textile Industries	35.7	35.4	10.8	15.3
Knitting Mills	27.5	31.9	3.2	3.4
Clothing Industries	11.5	20.1	4.2	4.4
Wood Industries	9.6	13.4	41.6	47.2
Furniture & Fixture Ind.	8.4	15.3	5.4	10.9
Paper & Allied Industries	10.5	16.1	47.3	48.1
Printing &Publishing	14.9	13.0	2.2	3.5
Primary Metal Industries	21.9	28.2	39.3	39.9
Metal Fabricating Industries	24.3	31.4	10.9	16.0
Machinery Industries	59.0	67.9	31.1	45.4
Transportation Equipment Ind.	57.8	66.4	58.2	63.1
Electrical Products Industries	31.2	47.0	14.8	24.4
Non-Metallic Mineral Prod. Ind.	15.7	20.2	8.4	10.4
Petroleum & Coal Products Ind.	10.2	4.6	4.4	8.8
Chemical & Chemical Prod. Ind.	24.0	24.5	4.4	5.1
Miscellaneous Manufacturing Ind..	45.2	56.3	15.4	24.1
Construction Industry	0.0	0.0	0.0	0.0
Electric Power, Gas & Other Utilities	3.1	3.1	9.3	7.3
Transportation & Storage	2.6	3.0	2.0	2.0
Communication	0.4	0.3	2.0	6.0
Wholesale Trade	2.3	4.1	8.5	10.6
Retail Trade	0.4	0.5	0.3	0.3
Other Finance, Ins. & Real Estate	0.0	0.0	0.0	0.0
Serv. to Business Management	3.0	3.6	0.8	1.3
Education & Health Serv.	0.0	0.4	0.0	0.8
Amusement & Recreation S.	0.0	0.6	0.0	0.2
Accommodation & Food Services	13.9	12.6	6.8	6.4
Other Personal & Miscellaneous Serv.	0.0	0.0	0.0	0.0

Source Statistics Canada, Input-Output Division, and Calculations of Authors.

Table A-11

Percent Change in Employment Requirements by Industry Due to Changing Composition and Level of Final Demand, Canada, 1971-1981

	Total		Imports		Exports		Trade		Domestic Demand	
	Comp.	Level	Comp.	Level	Comp.	Level	Comp.	Level	Comp.	Level
Agriculture	0.1	-0.3	1.0	-7.0	-2.2	12.4	-1.2	4.7	-1.2	28.3
Forestry	0.0	1.2	0.3	-8.8	-1.6	25.0	-1.3	16.2	-0.9	20.4
Fishing,Hunting & Trapping	-3.2	82.5	8.3	-34.4	2.1	50.8	10.3	16.4	-5.6	31.8
Metal Mines	-0.3	-3.2	0.1	-18.1	-7.1	20.1	-7.0	2.1	4.7	44.5
Mineral Fuels	-21.6	95.7	103.3	-116.0	49.3	-36.5	152.7	-152.5	-13.0	117.6
Non-Metal Mines & Quarries	-2.4	6.5	4.0	-14.5	-13.6	20.6	-9.6	6.2	1.8	25.3
Services Incidental to Mining	-20.5	140.1	5.1	-15.0	-11.0	17.4	-5.8	2.5	-9.1	138.9
Food & Beverage Industries	-0.3	6.5	1.1	-7.4	0.1	7.4	1.2	0.0	-1.2	20.0
Tobacco Products Industries	0.6	-10.0	1.4	-2.8	-1.8	2.6	-0.3	-0.2	1.3	18.5
Rubber & Plastic Products Ind	-2.9	39.7	2.6	-51.1	3.0	29.8	5.6	-21.3	-6.4	71.6
Leather Industries	8.3	-14.7	0.3	-29.5	0.2	3.1	0.6	-26.4	-12.7	53.0
Textile Industries	-0.5	-2.3	12.1	-41.6	2.6	15.9	14.7	-25.7	-5.3	58.5
Knitting Mills	0.5	-14.8	4.0	-19.9	0.0	0.8	4.0	-19.1	-2.9	43.2
Clothing Industries	1.1	-4.5	-3.5	-12.1	-0.5	1.5	-3.9	-10.6	-1.4	37.2
Wood Industries	0.3	21.3	-0.5	-8.6	2.6	24.3	2.1	15.7	-1.6	25.6
Furniture & Fixture Ind.	-12.0	33.8	-5.6	-13.0	4.9	6.1	-0.8	-6.9	-16.9	63.6
Paper & Allied Industries	-2.0	11.0	-0.3	-13.7	-5.2	23.2	-5.5	9.5	0.2	29.5
Printing &Publishing	0.3	25.7	3.0	-18.9	0.8	8.8	3.8	-10.1	-3.2	58.8
Primary Metal Industries	-4.6	14.1	-1.0	-41.1	-7.9	36.6	-8.9	-4.4	-1.0	64.4
Metal Fabricating Industries	0.5	13.9	-1.1	-35.3	3.9	16.5	2.8	-18.8	-1.9	63.0
Machinery Industries	6.9	44.9	-20.3	-100.9	21.8	37.3	1.5	-63.6	2.5	152.6
Transportation Equipment	2.4	16.0	4.7	-59.0	-4.4	36.7	0.3	-22.4	6.1	65.8
Electrical Products Ind.	-1.3	4.8	-17.0	-51.6	9.1	18.3	-7.9	-33.3	-2.5	78.4
Non-Metallic Mineral Prod.	-0.1	6.5	1.2	-24.2	-0.6	10.9	0.7	-13.3	-0.2	43.9
Petroleum & Coal Products	-4.5	57.1	11.4	-17.5	3.2	16.5	14.5	-0.9	-16.5	56.8
Chemical & Chemical Prod.	-1.3	15.6	2.3	-34.6	0.8	21.2	3.8	-13.4	-3.3	59.0
Miscellaneous Manufacturing	-4.7	19.9	-7.7	-63.4	4.8	13.1	-2.9	-50.2	-5.7	98
Construction Industry	-2.3	25.5	0.3	-1.3	-0.4	1.5	-0.1	0.1	-3.0	34.5
Electric Power, Gas & Other	14.7	35.0	1.0	-11.1	3.0	13.0	4.0	1.9	15.9	43.8
Transportation & Storage	-2.0	26.5	0.9	-9.3	-0.9	16.6	0.0	7.3	-3.2	37.7
Communication	7.2	41.0	-0.9	-10.4	0.9	7.3	0.0	-3.0	9.5	56.2
Wholesale Trade	-1.3	40.4	-0.2	-12.8	0.9	12.2	0.6	-0.6	-1.9	51.0
Retail Trade	-2.2	48.6	0.1	-2.7	-0.2	2.5	-0.2	-0.2	-2.0	47.4
Other Finance, Ins. & Real E.	5.5	59.0	0.5	-11.6	-0.5	7.2	0.1	-4.4	5.4	61.2
Serv. to Business Man.	13.9	99.3	-2.5	-41.3	1.5	25.4	-1.1	-15.9	12.6	81.5
Education & Health Serv.	3.3	49.0	-0.7	-0.5	1.6	0.8	0.9	0.3	-4.7	57.8
Amusement & Recreation S.	21.3	64.1	-0.7	-3.0	0.4	1.5	-0.3	-1.5	22.3	65.7
Accommodation & Food S.	0.7	71.8	0.0	-3.4	0.0	2.1	0.1	-1.4	0.9	59.5
Other Personal & Misc. S.	-16.4	98.9	-0.1	-3.3	-0.4	3.0	-0.5	-0.4	-5.9	47.8
Total	-1.0	36.4	0.0	-15.6	-0.2	11.6	-0.2	-3.9	-0.2	50.0

Source Statistics Canada, Input-Output Division, and Calculations of Authors.

Appendix B: Methodology

Statistics Canada's input-output open model was used to generate output for all the simulations found in this document. This model is based on the premises that output can be distributed amongst various industrial sectors and that inputs can be determined for each industry and for each commodity. For each year under consideration, a matrix D of market share coefficients and a matrix B of technological coefficients are thus derived[1].

The model as used here can be written as follows:

$$g_t = [I - D_t B_t]^{-1} D_t[e^*_t + X_t - M_t] \qquad (1)$$

where

g_t = vector of gross outputs by industry, in constant 1971 dollars;

D_t = matrix of market shares for year t, in constant 1971 dollars;

B_t = industry technology matrix for year t, in constant 1971 dollars;

e^*_t = vector of domestic final demand, in constant 1971 dollars. This vector include personal consumption, fixed capital formation, value of additions to inventories and government expenditures on goods and services.

X_t = value of domestic exports for year t, in constant 1971 dollars;

M_t = value of imports for year t, in constant 1971 dollars.

Vector g_t includes output arising from final demand and from intermediate demand of other industries. (For details as to the proportion of output serving as inter - mediate input to other industries, see Table A-9).

Decomposition of Output

By starting with data from 1981 and replacing each term progressively with 1971 values, changes in output by industry were separated into changes due to imports, exports, domestic final demand and changes in the technological coefficients of production (ie., the technology and market share matrices). Thus, starting with 1981, we have:

$$g_1 = [I - D_{81} B_{81}]^{-1} D_{81}[e^*_{81} + X_{81} - M_{81}]. \qquad (2)$$

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[1] See Statistics Canada, *The Input-Output Structure of the Canadian Economy*, Catalogue no. 15-201 for a more complete description of the model.

By replacing M_{81} (imports of 1981) with M_{71} (imports of 1971), we obtained:

$$g_2 = [I - D_{81}B_{81}]^{-1} D_{81}[e^*_{81} + X_{81} - M_{71}]. \quad (3)$$

Then taking the difference between (2) and (3), we obtained:

$$\Delta g_M = g_2 - g_1 = [I - D_{81}B_{81}]^{-1} D_{81}[- M_{81} + M_{71}]. \quad (4)$$

where Δg_M refers to the change in output resulting from a change in imports, all other factors remaining the same. (See Table A-10 for the share of imports and exports of commodities produced by Canadian industries).

To obtain change in output due to changes in exports, the decomposition was allowed to go further and exports of 1981 (X_{81}) were replaced with those of 1971 (X_{71}) in equation (3). Thus,

$$g_3 = [I - D_{81}B_{81}]^{-1} D_{81}[e^*_{81} + X_{71} - M_{71}], \quad (5)$$

and taking the difference between this equation and (3) yeilded:

$$\Delta g_X = g_3 - g_2 = [I - D_{81}B_{81}]^{-1} D_{81}[X_{81} - X_{71}]. \quad (6)$$

where Δg_X refers to the change in output resulting from a change in domestic exports, all other factors remaining the same. Had exports been decomposed first and then imports, the same results would have ensued.

Change in output due to changes in domestic final demand, was calculated in a similar manner and resulted in the following expression:

$$\Delta g_{e^*} = [I - D_{81}B_{81}]^{-1} D_{81}[e^*_{81} - e^*_{71}]. \quad (7)$$

Lastly, change in output due to changes in the technology and market share matrices resulted in the following expression:

$$\Delta g_t = [I - D_{81}B_{81}]^{-1} D_{81} - [I - D_{71}B_{71}]^{-1} D_{71}) [e^*_{71} + X_{71} - M_{71}]. \quad (8)$$

Also included in this last factor Δg_t were residual changes due to re-exports, inventory withdrawals and government sale of goods and services. Thus, the sum of Δg_X, Δg_M, Δg_{e^*}, and Δg_t equals the total change in output between 1971 and 1981.

In some cases, the absolute value of the change in employment requirements would have been different had 1971 been used as the base year rather than 1981. However, the relative importance of each factor does not change. To assess this difference, the decomposition of output due to the various factors identified above have also been done using 1971 instead of 1981 as the basis for decomposition. Changes in output due to changes in imports, exports, domestic final demand and

to the technology and market share matrices were calculated in the following fashion:

$$\Delta g_M' = [I - D_{71}B_{71}]^{-1} D_{71}[- M_{71} + M_{81}], \quad (9)$$

$$\Delta g_X' = [I - D_{71}B_{71}]^{-1} D_{71}[X_{71} - X_{81}], \quad (10)$$

$$\Delta g_{e^*}' = [I - D_{71}B_{71}]^{-1} D_{71}[e^*_{71} - e^*_{81}], \quad \text{and} \quad (11)$$

$$\Delta g_t' = ([I - D_{71}B_{71}]^{-1} D_{71} - [I - D_{81}B_{81}]^{-1} D_{81}) [e^*_{81} + X_{81} - M_{81}]. \quad (12)$$

Decomposition of Output into Changes in Employment

To measure the change in employment requirements by industry resulting from a change in output, the above changes in output were multiplied by job-output ratios, L. For instance, to measure the change in employment requirements due to changing levels of imports (i.e., ΔIE_M), Δg_M was multiplied by L_{81}:

$$\Delta IE_M = \Delta g_M \cdot L_{81}, \quad (13)$$

where L_{81} is the job-output ratio of 1981.

Similarly, Δg_X, Δg_{e^*} and Δg_t were estimated and multiplied by L_{81} to yeild ΔIE_X, ΔIE_{e^*} and ΔIE_t, respectively.

Because of the job-output ratios being different for 1971 and 1981, an additional factor could then be introduced and change in employment requirements due to changing labour productivity, ΔIE_L, was then calculated as follows:

$$\Delta IE_L = [I - D_{81}B_{81}]^{-1} D_{81}[e^*_{81} + X_{81} - M_{81}] \cdot (L_{81} - L_{71}) \quad (14)$$

where L_{81} and L_{81} are the job-output ratios of 1971 and 1981, respectively.

Change in Employment by Occupation

Changing occupational distribution of employment requirements was calculated by multiplying the above-mentioned changes in employment requirements by an industry/occupation matrix, O. The data was obtained from the 1971 and 1981 Censuses for 81 occupations and 39 industries. Changes in employment requirements by occupation due to changing imports, exports, domestic final demand and technical coefficients (*technology* and *market share* matrices) were calculated using the industry/occupation matrix of 1981 (O_{81}) to yeild ΔOE_X, ΔOE_M, ΔOE_{e^*} and ΔOE_t, respectively (e.g., $\Delta OE_X = \Delta IE_X \cdot O_{81}$). An additional factor was

introduced to account for the changing employment requirements due to the changing mix of occupations within industries. This can be expressed as:

$$\Delta OE_c = [I - D_{71}B_{71}]^{-1} D_{71}[e^*_{71} + X_{71} - M_{71}] \cdot L_{71} \cdot (O_{81} - O_{71}) , \quad (15)$$

where O_{81} and O_{81} are the industry/occupation matrices of 1971 and 1981, respectively.

Import Leakages

Imports are valued at the level of production at the Canadian border and are usually registered F.O.B. (free on board) from the last point of export. They are viewed as either displacing domestic production or being contained in exports.

To measure changes in employment requirements due to changing import content of exports, output due to exports was estimated for both 1971 and 1981 in the following fashion:

$$g_{X81} = [I - D_{81}(I - \mu_{81})B_{81}]^{-1} D_{81} X_{81} , \quad (16)$$

$$g_{X71} = [I - D_{71}(I - \mu_{71})B_{71}]^{-1} D_{71} X_{71} , \quad (17)$$

where μ_{71} and μ_{81} represent import/use vectors for 1971 and 1981, respectively (i.e., $\mu_{71} = M_{71} / (B_{71}g_{71} + e^*_{71} + X_{R71})$, where X_{R71} is re-exports and R.H.S., the ratio of imports to total domestic use of a commodity).

Then by using these values (g_{X71} and g_{X81}), the import employment requirement content of exports (i.e., ΔEM_X) was calculated in the following manner:

$$\Delta EM_X = [I - D_{81}B_{81}]^{-1} D_{81} [\mu_{81} B_{81} g_{X81} - \mu_{71} B_{71} g_{X71}] \cdot L_{81} . \quad (18)$$

Similarly, the displacement of employment requirements due to imports meeting domestic final demand was estimated in the following manner:

$$\Delta EM_{e^*} = [I - D_{81}B_{81}]^{-1} D_{81} [\mu_{81} B_{81} g_{e^*81} + \mu_{81} e^*_{81} - \mu_{71} B_{71} g_{e^*71} - \mu_{71} e^*_{71}] \cdot L_{81} . \quad (19)$$

By subtracting ΔEM_{e^*} from ΔIE_{e^*}, we can obtain the value of employment requirements associated with domestic final demand free of import leakages (i.e., excluding domestic final demand met by imports). Similarly, $\Delta IE_X - \Delta EM_X$ represents the change in employment requirements due to exports excluding imports used as intermediate input in the production of exports. The sum of (18) and (19) is, by definition, equal to ΔIE_M.

The Changing Mix Versus Level of Final Demand

Between 1971 and 1981, final demand components changed in terms of both mix and level. To measure how, for instance, the changing mix (or distribution) of imports affected employment requirements, the following was estimated:

$$\Delta IE_M^D = [I - D_{81}B_{81}]^{-1} D_{81}[M_{71}' - M_{71}] \cdot L_{81}. \qquad (20)$$

where M_{71}' represents the imports distributed according to the imports of 1981, but with the import level of 1971. The changing employment requirements due to changes in the level of imports between 1971 and 1981, ΔIE_M^D, was simply the difference between ΔIE_M^D and ΔIE_M. (See Table A-13).

Decomposing Change in Share of Employment Into Its Components

In algebraic terms, the decomposition of industry change in share of employment in industry i, ΔP_i, between two years t (=0,1), can be expressed by:

$$\Delta P_i = P_{i,1} - P_{i,0} = (E_{i,1} / E_{T,1}) - (E_{i,0} / E_{T,0}) \qquad (21)$$

$$= (E_{i,0}(1+r_i) / E_{T,0}(1+r_T)) - (E_{i,0} / E_{T,0}),$$

where r_i is the percent change in employment over the period for industry i, $E_{i,t}$ denotes employment in industry i at year t and $E_{T,t}$, total employment at year t. But r_i can be decomposed into percentage change in employment requirements due to imports, exports, domestic final demand and technical coefficients (*technology* and *market share* matrices) (r_i^M, r_i^X, $r_i^{e^*}$ and r_i^t, respectively)[2]. The resulting expression is as follows:

$$\Delta P_i = (E_{i,0} / E_{T,1}) [(r_i^M - r_T^M) + (r_i^X - r_T^X) + (r_i^{e^*} - r_T^{e^*}) + (r_i^t - r_T^t)] \qquad (22)$$

Each of the four terms is a measure of the significance of each factor in the total change in share (or change in structure) of an industry's employment requirements. In practice, some of the right-hand terms are positive, while others are negative. In order to obtain an overall measure (across all industries) of the significance of a factor in the restructuring of employment requirements for the entire economy (independent of the direction of the effect of the factor), one can take the sum of the absolute values of the four factors. That is, for a particular industry i, let

$$\Delta P_i' = (E_{i,0} / E_{T,1}) [|(r_i^M - r_T^M)| + |(r_i^X - r_T^X)| + |(r_i^{e^*} - r_T^{e^*})| + |(r_i^t - r_T^t)|]. \qquad (23)$$

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2 For example $r_i^M = (\Delta IE_M / E_{i,0}) * 100$. (See also Martin and Evans, 1981).